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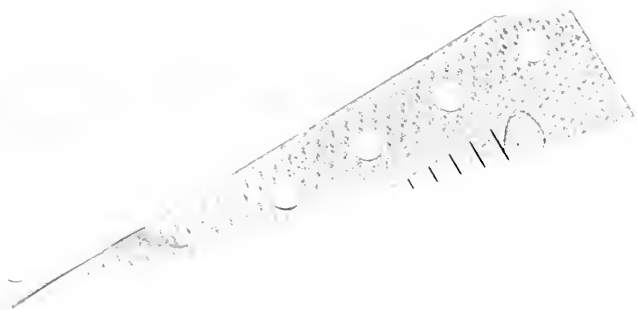

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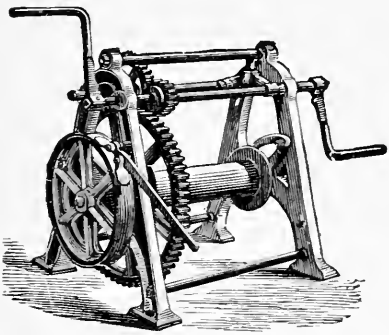

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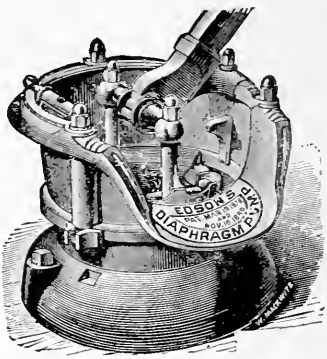

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HANDBOOK

FOR

ARCHITECTS AND BUILDERS

PUBLISHED UNDER THE AUSPICES
OF THE

Chicago Architects' Business Association

1901

FOURTH YEAR

CHARLES R. ADAMS
EDITOR

CHICAGO:
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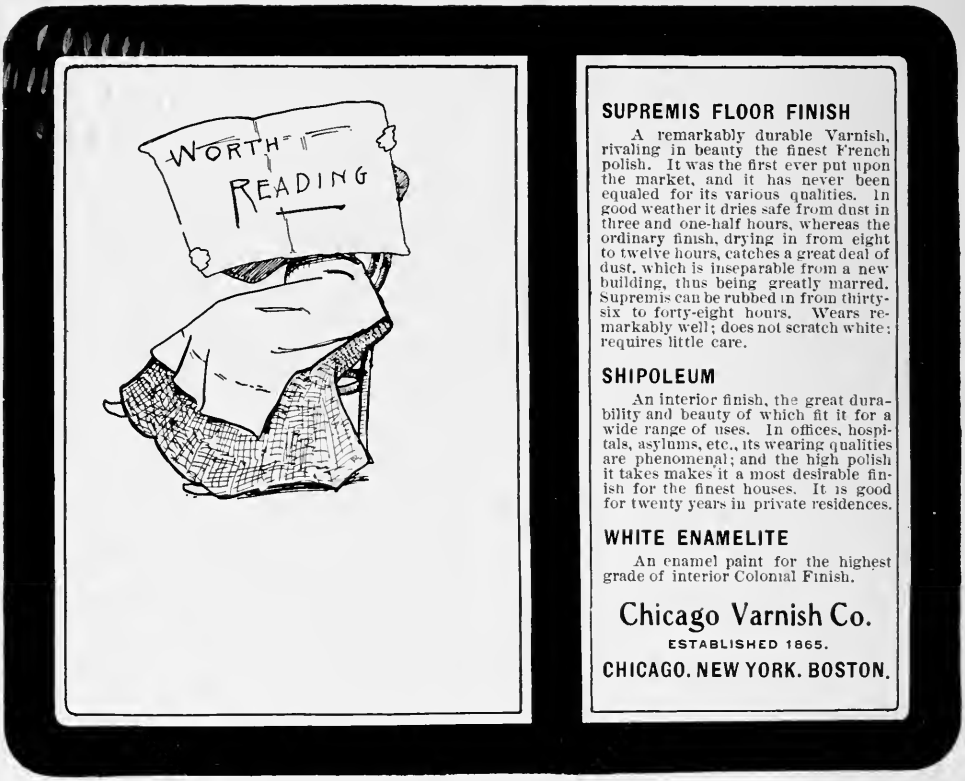

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PREFACE.

THE demand for the "Handbook for Architects and Builders," issued under the auspices of the "Chicago Architects' Business Association," has increased yearly as the several editions have appeared, and it is exceedingly gratifying to those interested in its publication to know that what its pages contain enables architects and others using it to keep posted on the changes made from time to time in the many ordinances of the city affecting the building trades. The task of collating the various laws in force, and so arranging them that reliable information will result, is not easy, but it is a pleasurable one when the compiler is assured that the information furnished is of such a useful character that the book is indispensable.

It will be noted that several amendments have been made in the building ordinance, and these are put at the end of that passed March 28, 1898, and references are made in the index to the sections changed.

Several alterations have been made in the laws relating to drainage, plumbing, etc., and by the courtesy of the Health Department they are printed in full. The laws as they now stand should be carefully studied, as the changes are very important.

The Fire Limits have been extended, and are noted, together with further legislation governing the erection of elevators.

New and reliable data in connection with Steam and Water Heating have been added, and will be found handy for reference.

The miscellaneous information has been added to, and a map showing the new ward boundaries of the city, and giving the names of the several aldermen will be found useful. The lien law, which has appeared for three successive years, has been withdrawn from the present edition, and space has thus been given for matter of greater moment.

Rules for the measurement of masonry and plastering are again inserted, by request.

The thanks of the Committee on Publication are tendered to all who have so generously aided in making the work so great a success. The Handbook is sent gratuitously to every architect in the State.

Yours truly,

GEORGE BEAUMONT,
S. A. TREAT,
HENRY LORD GAY.
A. F. WOLTERSDORF,
E. M. NEWMAN,
E. STANFORD HALL,
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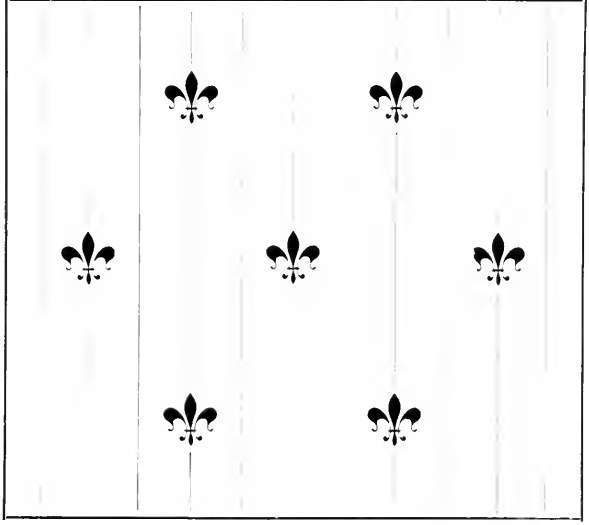
Committee on Publication.

WE call especial attention to the business announcements on these pages. We have accepted only such houses as are absolutely first-class and reliable. In the light of knowledge which we have upon the subject, acquired by experience, we feel that we have used every discretion in the matter of those represented herein.



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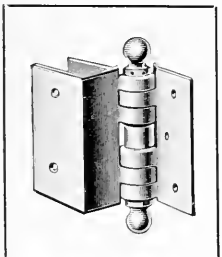

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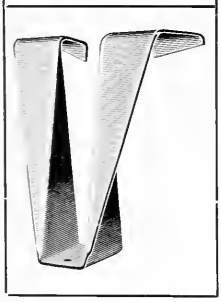

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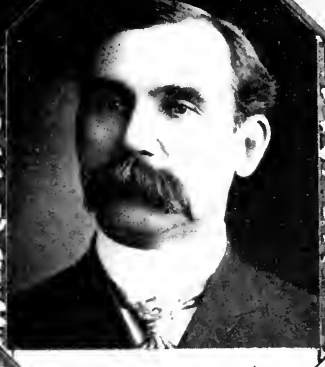

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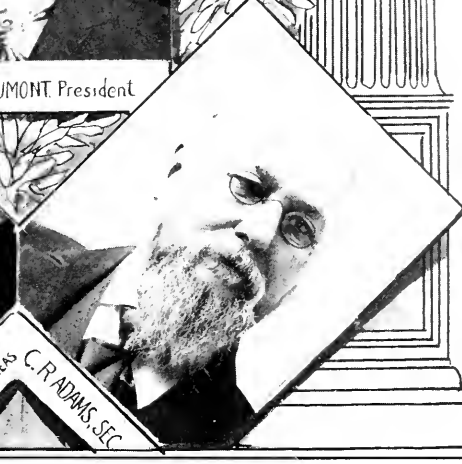

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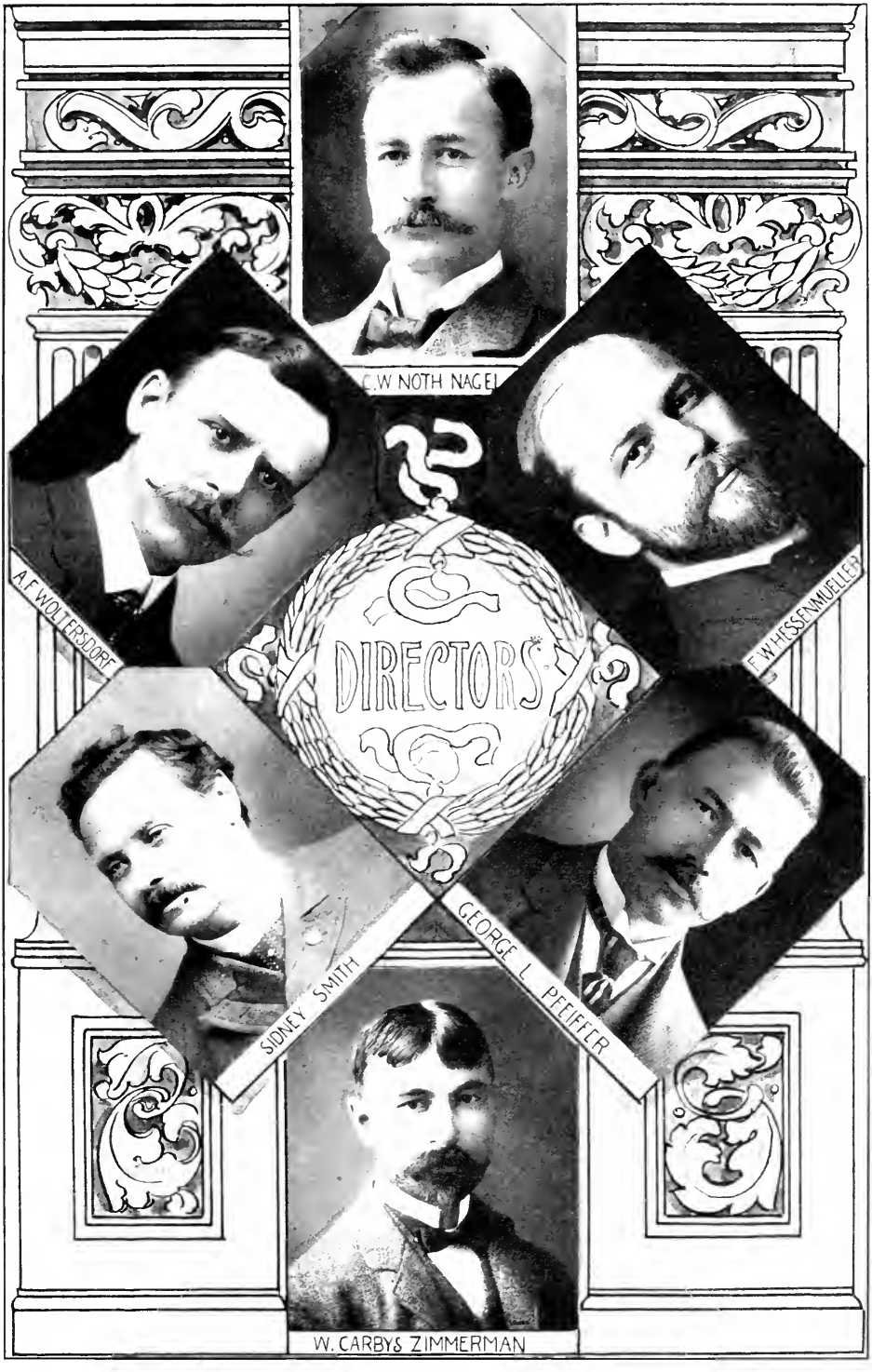
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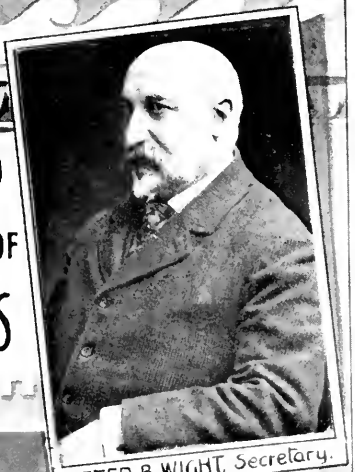

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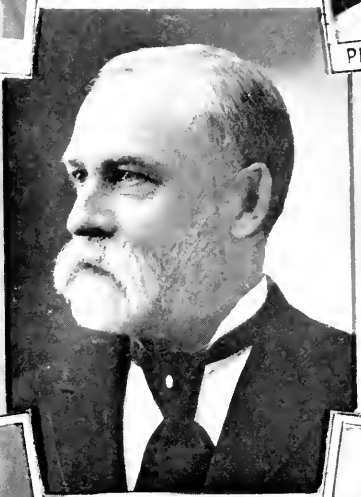

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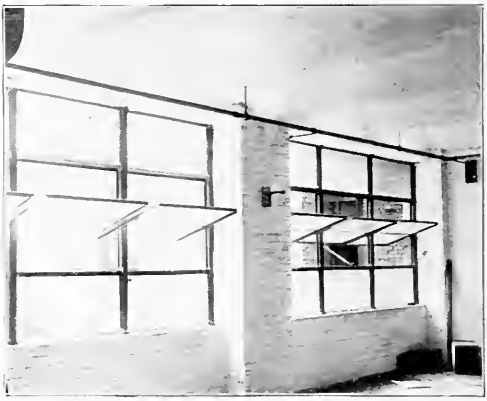

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CHICAGO ARCHITECTS' BUSINESS ASSOCIATION.

(Incorporated June 25, 1897.)

Since the last issue of the "Handbook" the Association has kept closely to the platform it started upon, and neither time nor energy has been spared to better the position of the Architect and those allied with him. Immediate results can hardly be expected. The many difficulties to be surmounted to attain the end have to many appeared insurmountable. "Reform" is looked upon by some as a step to "ruin," but it must be realized that the aims of the Association are for the good of the many and not for a few. The sole object of some is to accept a paltry pittance for plans for some speculator, which plans may eventually be carried out irrespective of any building ordinance or supervision on the part of the maker of them, and without regard to integrity. It should be obligatory for the architect designing a building to carry it out. Much of the trouble experienced from unsafe and badly constructed buildings would be avoided and the owner who wished to build would (unless he were one who calculated to catch the eye and hence the purse of a future investor) build in such a manner that scrutiny of the work would rather be courted than objected to. Unfortunately the idea of "how cheap, not how good" can a structure be put up is the prevailing one, and it is invariably so when the property is upon completion, or earlier, put in the market for sale. Unfortunately the principle maintains to borrow as much money as possible to build with and then to spend as little as can be done to give a handsome exterior with a proportionate amount of cheap, showy work inside. Were the work superintended by the architect it would or should be carried out according to the city ordinance and in keeping with the plans submitted to the authorities at the time a permit is issued. To bring about these results is one of the works undertaken by this Association, and already a change is noticeable in many buildings examined. As yet there is much to be done by city inspectors to warrant a clean certificate. There is no reason why any distinction should be made either toward the architect, owner or contractor, the ordinances do not, nor should they, discriminate in favor of any particular person or persons, and the Association will continue to use its anathemas against the evils that exist. There are undoubtedly many capitalists, contractors and others who are particularly satisfied with conditions as they are, for such conditions suit their methods. The amount of insurance against fire is raised throughout to suit their particular cases and the owners of good buildings have to pay a higher rate than they otherwise would, were a stop put to the erection of so many "fire traps." This Association is not in any way attempting to cripple the work of the Building Department, but is anxious to aid it in bringing about such reforms as will redound to its credit by insisting upon a fulfillment of its ordinances. The ordinances themselves are too cumbersome and in some cases ambiguous, and a careful revision would be of

infinite advantage to all concerned. (Many amendments will be found in this volume at the end of the building ordinance of 1898.) The Association will gladly work with the view to other revision.

It seems strange that in these times of constant revolution that so little should be thought of the good to be derived from the interchange of ideas among the members of a profession who are confronted with new problems in construction and use of materials. To bring about a satisfactory and elevating state of things, but little sacrifice of time need be made by men standing high in the profession, the rapid advances made in kindred "learned societies" (the words "learned societies" apply to the acknowledged professions and architecture is one of them) are brought about by interchange of ideas among the component members, and it is much to be regretted that every architect does not directly encourage the association by becoming part of it. The time is coming when the other states will follow the lead of Illinois and form a standard which must be attained to qualify an aspirant for the honor to practice architecture.

Among the subjects discussed during the year was "What Constitutes Architects' Superintendence?" and it elicited a spirited discussion. The time was when the architect's duties were limited and 5 per cent. was the charge for them. To-day the work has become more complicated, and higher qualifications are a matter of necessity, and more of the architect's time is required. A civil engineer may design the construction, the services of heating and electrical experts may be called in, and sanitation must receive consideration, so that the architect is called upon to superintend and carry out details which in time past were not even thought of. His labor has been considerably multiplied and the superintendence required of him was not conceived at the time the American Institute fixed the compensation for it.

It has been suggested that for buildings of any magnitude, say from $15,000 upwards, a clerk of the works be employed, to be paid by the owner in addition to the architect's fees, and who should supervise the work under the direction of the architect, such time being given as the exigencies of the case demanded. Experience has taught that 5 per cent. will not warrant continuous supervision on works of large size, and especially when complicated construction and appliances enter in. The matter should be carefully considered, as much chance is taken by the architect in the effort to rush jobs through, and the probability of things going wrong, with the consequent expenses to him, call for much thought in the premises.

It may be stated in conclusion that committees on "public action" are at work and important results are looked for. That building be done upon honest principles is advocated and a line of policy to this end will be pursued without regard to party politics.

Lack of space deters us from speaking more upon matters the Association has under consideration, suffice it to say they are numerous and important, and they appeal to everyone who desires to raise architecture to the plane occupied by the other learned professions.

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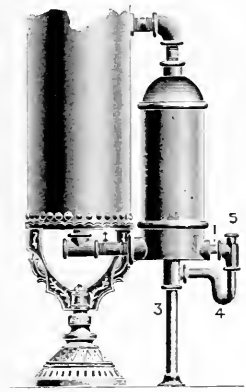

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RULES OF PRACTICE.

DRAWINGS.

Section 1. All drawings forming a basis for contracts shall be drawn to a scale of not less than one-eighth of an inch to the foot, in ink or by some other process that will not obliterate. General dimensions shall be accurately figured and the drawings made *explicit* and *complete*.

SCALE DRAWINGS.

Section 1. All portions of the work that require a larger scale to illustrate the same shall be drawn full size or to a scale large enough to make them fully set forth what is required by the Architect. No Architect shall ask for bids on any work until all general drawings are complete and sufficient details made, which in connection with the specifications will settle all questions affecting the cost of work.

SUPERVISION OF WORK.

Section 1. The supervision of an Architect shall be such as shall require the faithful execution of the work according to the true meaning and intent of the Plans and Specifications, but such supervision does not cover the duties of a clerk of the works. In case there is no clerk of the works provided by the Owner, Contractors must refer any questions about which there can be any doubt to the Architect for decision before proceeding to execute the work.

SPECIFICATIONS.

Section 1. Specifications must be prepared in ink or by some permanent process, and shall clearly explain the kind and quality of materials and methods of construction, and give such further information as may be needed to definitely supplement the Drawings.

Sec. 2. Everything that will be required in the work must be mentioned in the Specifications, as far as practicable, being classified and grouped under appropriate headings, and work called for by the Plans and not referred to in the Specifications, and vice versa, shall be included same as if mentioned by both Plans and Specifications, provided such work comes clearly within the branch or branches covered by the contract.

RULES FOR LETTING CONTRACTS.

Section 1. Written invitations for proposals will be forwarded Contractors for work to be let, stating when bids will be opened. This does not apply to public work requiring advertisement for proposals.

Sec. 2 Contractors desiring place upon the roster of an Architect's office shall furnish references as to *mechanical ability and fidelity* and be prepared to furnish a good and sufficient bond.

Sec. 3. Proposals shall be presented on the day set for opening of same, and will be opened in the presence of a representative of the bidders.

Proposals shall be opened, read and posted at the time specified before such bidders as are present. Contracts shall be awarded by Owners or Architects within a reasonable time thereafter.

Bidders shall not be held on proposals retained longer than ten days after date of opening.

Sec. 4. The lowest bidder will not be permitted to change the amount of his bid, but must sign contract or withdraw. The right is reserved to reject any or all proposals.

Sec. 5. If, after the opening of bids, changes are made in the Plans and Specifications amounting to not more than 10 per cent., the lowest invited bidder

shall tender a detailed proposition for said changes, subject to the approval of the Architect and owner, and if found fairly detailed, the contract shall be awarded to him upon his bid so changed.

Sec. 6. Lack of ability to carry out the work in a proper manner, want of fidelity or disposition to render less than is due the Owner in strict conformity with the terms of contract, shall lay the Contractor liable to be dropped from the roster of the Architect, temporarily or permanently, as in the judgment of the Architect is just and right, and in the interests of his clients.

Sec. 7. Final certificates of payment on a contract shall not be issued by the Architect until the Contractor has returned all Plans and Specifications to the office of the Architect.

H. B. WHEELOCK, President.

Adopted September 9, 1897.

C. R. ADAMS, Secretary.

Schedule of Charges for Professional Services, Recommended by the Association.

For full professional services (including supervision) 5 per cent. upon the cost of the work, except as below stated.

For partial services in case of abandonment or suspension of the work, the charge is as follows: Preliminary studies, 1 per cent. General drawing and Specifications, 2½ per cent. Details, 1 per cent.

EXCEPTIONS TO ABOVE RATES AS BELOW.

Dwellings costing less than $10,000	7 per cent.
Dwellings costing more than $10,000	6 per cent.
In no case shall the fee for any dwelling be less than $150.	
Hospitals	8 per cent.
Factories	4 per cent.
Warehouses	4 per cent.
Additions and alterations to dwellings	10 per cent.
If less than $1,000	12 per cent.
Additions and alterations to business buildings	7 per cent.
Alterations to store fronts and store fittings	10 per cent.
Designs for furniture	15 per cent.
Designs for inside finish	10 per cent.
Monumental and wrought metal work	15 per cent.

An additional charge will be made for additions and alterations in plans and contracts in proportion to time expended.

Necessary traveling expenses to be paid by the owner.

The Architect's payments are successively due as the work is completed.

Until an actual estimate is received, the charges are based on the proposed cost of the works, and the payments are received as installments of the entire fee.

The Architect bases his professional charge upon the entire cost to the owner of the building, when completed, including all fixtures necessary to render it fit for occupancy, and all old materials used are to be reckoned in cost as if new.

An Architect's duties comprise:

The furnishing of all necessary drawings, specifications and instructions; the general supervision of work and the auditing of all accounts.

Drawings and specifications are the property of the Architect.

Where a special Superintendent or Clerk of Works is required, the expense is to be borne by the owner. He will remain at the works during its progress, and secure the proper fulfillment of the contract. He will be selected by the Architect, to whom he will report.

EXTRA SERVICES.

Consultation fees for professional advice are to be paid in proportion to the importance of the questions involved at the discretion of the Architect, and none of the charges above enumerated cover professional or legal services connected with negotiations for site, disputed party walls, right of light, measurement of work or services incidental to arrangements consequent upon the failure of contractors during the performance of the work.

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AN ACT

TO PROVIDE FOR THE LICENSING OF ARCHITECTS, AND REGULATING THE PRACTICE OF ARCHITECTURE AS A PROFESSION.

Enacted by the Fortieth General Assembly, at the Regular Biennial Session, and Approved June 3, 1897.

Section 1. **Appointment of a State Board of Examiners of Architects.** — *Be it enacted by the People of the State of Illinois, represented in General Assembly*, That within thirty days after the passage of this act the Governor of this State shall, by the advice and consent of the Senate, appoint a State Board of Examiners of Architects, to be composed of five members, one of whom shall be a member of the faculty of the Illinois State University, and the other four shall be architects residing in the State of Illinois, who have been egaged in the practice of architecture at least ten years. Two of the said practicing architects appointed as examiners shall be designated to hold office for two years from the date of the passage of this act, and the other two, together with the member of the faculty aforesaid, shall hold office for four years from the passage of this act; and thereafter, upon the expiration of the term of office of the person so appointed, the Governor of the State shall appoint a successor to each person whose term of office shall expire, to hold office for four years, and said person so appointed shall have the above specified qualifications. In case appointment of a successor is not made before the expiration of the term of any member, such member shall hold office until a successor is appointed and duly qualified. Any vacancy occurring in membership of the board shall be filled by the Governor of the State for the unexpired term of such membership.

Sec. 2. **Examiners to file Oath of Office with the Secretary of State — Treasurer to file Bond—Salary of Secretary and Members of Board of Examiners.**—The members of the State Board of Examiners of Architects shall, before entering upon the discharge of their duties, make and file with the Secretary of State the constitutional oath of office. They shall, as soon as organized, and annually thereafter, in the month of January, elect from their number a president and a secretary, who shall also be a treasurer. The treasurer shall file a bond for the penal sum of $5,000, with the Secretary of State, to be accepted by the Governor of the State, before entering upon his duties. The board shall adopt rules and regulations to govern its proceedings, not inconsistent with this act, and a seal, and the secretary shall have the care and custody thereof, and shall keep a record of all the proceedings of the board, which shall be open at all times to public scrutiny. The secretary of the board shall receive a salary which shall be fixed by the board, and which shall not exceed the sum of fifteen hundred dollars ($1,500) per year; he shall also receive his traveling and other expenses incurred in the performance of his official duties. The other members of the board shall receive the sum of ten dollars ($10) for each day actually engaged in this service, and all legitimate and necessary expenses incurred in attending the meetings of said board; said expense shall be paid from the fees received by the board under the provisions of this act, and no part of the salary or other expenses of the board shall be paid out of the State treasury. All moneys received in excess of the said per diem allowance and other expenses provided for, shall be held by the treasurer as a special fund for meeting the expenses of said board, and the cost of an annual report of the proceedings of the State Board of Examiners of Architects.

Provided, however, that when the money in the hands of the treasurer at the time the

annual report is rendered exceeds twenty-five hundred dollars ($2,500), the amount of such excess shall be paid into the State treasury, to the credit of the State Board of Examiners of Architects.

Sec. 3. **Quorum – Meetings of Board — Rules and Regulations.** — Three members of the board shall constitute a quorum. Special meetings of the board shall be called by the secretary upon the written request of any two members, by giving at least seven days' written notice of the meeting to each member, reckoning from the day on which the notices are postmarked, telegraphed or personally delivered. The board shall adopt rules and regulations for the examination of applicants for licenses to practice architecture, in accordance with the provisions of this act, and may amend, modify and repeal such rules and regulations from time to time. The board shall, immediately upon the election of each officer thereof, and upon the adoption, repeal or modification of its rules of government or its rules and regulations for examinations of applicants for licenses, file with the Secretary of State, and publish in at least one architectural journal and one daily newspaper published in the State of Illinois, at least twice, the name and address of each officer, and a copy of such rules and regulations, or the amendment, repeal or modification thereof.

Sec. 4. **Examinations — Applicants for License to Pay a License Fee of $15 — License Fee, $25.**—Provision shall be made by the board hereby constituted for holding examinations, at least twice in each year, of applicants for license to practice architecture, and any person over twenty-one years of age, upon payment of a fee of fifteen dollars ($15) to the secretary of the board, shall be entitled to an examination for determining his or her qualifications. All examinations shall be made directly by said board, or a committee of two members delegated by the board, and due notice of the time and place of holding of such examinations shall be published, as in the case provided for the publication of the rules and regulations thereof. The examination shall have special reference to the construction of buildings, and a test of the knowledge of the condidate of the strength of materials, and of his or her ability to make practical application of such knowledge in the ordinary professional work of an architect, and in the duties of a supervisor of mechanical work on buildings, and should also seek to determine his or her knowledge of the laws of sanitation as applied to buildings. If the result of the examination of any applicant shall be satisfactory to a majority of the board, under its rules, the secretary shall, upon an order of the board, issue to the applicant a certificate to that effect, and upon payment to the secretary of the board by the candidate of a fee of twenty-five dollars ($25), he shall thereupon issue to the person therein named a license to practice architecture in the State, in accordance with the provisions of this act, which license shall contain the full name, birth-place and age of the applicant, and be signed by the president and secretary, and sealed with the seal of the board. If an applicant fails to pass said examination his or her fee shall be returned.

All papers received by the secretary in relation to applications for license shall be kept on file in his office, and a proper index and record thereof shall be kept by him.

Sec. 5. **Architects Who are Entitled to License Without an Examination.** — Any person who shall, by affidavit, show to the satisfaction of the State Board of Examiners of Architects that he or she was engaged in the practice of the profession of architecture on the date of the passage of this act, shall be entitled to a license without examination, provided such application shall be made within six months after the passage of this act. Such license, when granted, shall set forth the fact that the person to whom the same was issued was practicing architecture in this State at the time of the passage of this act, and is, therefore, entitled to a license to practice architecture without an examination by the Board of Examiners, and the secretary of the board shall, upon the payment to him of a fee of twenty-five dollars ($25), issue to the person named in said affidavit a license to practice architecture in this State, in accordance with the provisions of this act. In the case of a copartnership of architects, each member whose name appears must be licensed to practice architecture. No stock company or corporation shall be licensed to practice architecture, but the same may employ licensed architects. Each

licensed architect shall have his or her license recorded in the office of the county clerk in each and every county in this State, in which the holder thereof shall practice, and he or she shall pay to the clerk the same fee that is charged for the recording of notarial commissions. A failure to have his or her license so recorded shall be deemed sufficient cause for revocation of such license.

Sec. 6. **County Clerks to Keep Record of Licenses Recorded.**—Each county clerk shall keep in a book, provided for the purpose, a complete list of all the licenses recorded by him under the provisions of this act, together with the date of the issuance of each license.

Sec. 7. **Licensed Architects to Have a Seal.**—Every licensed architect shall have a seal, the impression of which must contain the name of the architect, his or her place of business, and the words "Licensed Architect," "State of Illinois," with which he shall stamp all drawings and specifications issued from his office for use in this State.

Sec. 8. **Penalty for Practicing Architecture Without License.**—After six months from the passage of this act it shall be unlawful, and it shall be a misdemeanor punishable by a fine of not less than fifty dollars ($50) nor more than five hundred dollars ($500) for each and every week during which said offense shall continue, for any person to practice architecture without a license in this State, or to advertise, or put out any sign or card or other device which might indicate to the public that he or she is entitled to practice as an architect.

Sec. 9. **Persons Who Are to be Regarded as Architects.**—Any person who shall be engaged in the planning or supervision of the erection, enlargement or alteration of buildings for others, and to be constructed by other persons than himself, shall be regarded as an architect within the provisions of this act, and shall be held to comply with the same; but nothing contained in this act shall prevent the draftsmen, students, clerks of works or superintendents, and other employes of those lawfully practicing as architects, under license as herein provided for, from acting under the instruction, control or supervision of their employers; or shall prevent the employment of superintendents of buildings paid by the owners from acting, if under the control and direction of a licensed architect who has prepared the drawing and specifications for the building. The term building in this act shall be understood to be a structure, consisting of foundations, walls and roof, with or without the other parts; but nothing contained in this act shall be construed to prevent any person, mechanic or builder from making plans and specifications for, or supervising the erection, enlargement or alteration of any building that is to be constructed by himself or employes, nor shall a civil engineer be considered as an architect unless he plans, designs or supervises the erection of buildings, in which case he shall be subject to all the provisions of this act, and be considered as an architect.

Sec. 10. **License Revoked.**—Architects' licenses issued in accordance with the provisions of this act shall remain in full force until revoked for cause, as hereinafter provided. Any license so granted may be revoked by unanimous vote of the State Board of Examiners of Architects for gross incompetency, or recklessness in the construction of buildings, or for dishonest practices on the part of the holder thereof, but before any license shall be revoked such holder shall be entitled to at least twenty days' notice of the charge against him, and of the time and place of the meeting of the board for the hearing and determining of such charge. And on the cancellation of such license it shall be the duty of the secretary of the board to give notice of such cancellation to the county clerk of each county in the State in which the license has been recorded, whereupon the clerks of the counties shall mark the license recorded in his office canceled. After the expiration of six months from the revocation of a license, the person whose license was revoked may have a new license issued to him by the secretary upon certificate of the Board of Examiners, issued by them upon satisfactory evidence of proper reasons for his reinstatement, and, upon payment to the secretary of the fee of five dollars ($5).

For the purpose of carrying out the provisions of this act relating to the revocation of licenses, the board shall have the power of a court of record, sitting in the county in which their meeting shall be held, and the power to issue subpoenas and compel the at-

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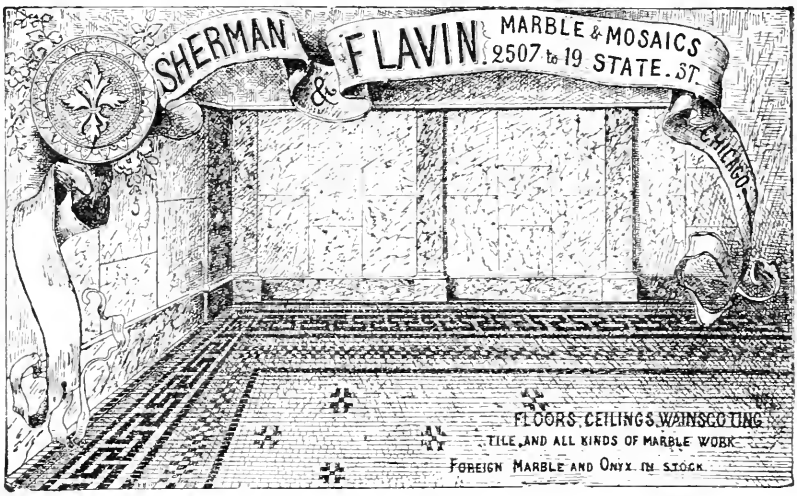

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tendance and testimony of witnesses. Witnesses shall be entitled to the same fees as witnesses in a court of record, to be paid in like manner. The accused shall be entitled to the subpoena of the board for his witnesses, and to be heard in person or by counsel in open public trial.

Sec. 11. **Renewal of License.**—Every licensed architect in this State who desires to continue the practice of his or her profession shall annually, during the time he or she shall continue in such practice, pay to the secretary of the board during the month of July a fee of five dollars ($5), and the secretary shall thereupon issue to such licensed architect a certificate of renewal of his or her license for a term of one year. Any licensed architect who shall fail to have his or her license renewed during the month of July in each and every year shall have his or her license revoked at the discretion of the board. But the failure to renew said license shall not deprive him or her of the right to renewal upon payment of said fee.

Sec. 12. **Report of Proceedings to be Filed with the Auditor of Public Accounts.**—Within the first week of December, after the organization of the board, and annually thereafter, the secretary of the board shall file with the Auditor of the State a full report of the proceedings of the board, and a complete statement of the receipts and expenditures of the board, attested by the affidavits of the president and secretary, subject to the approval of the State Auditor.

Sections 2 and 11 were amended by the 41st General Assembly, at the regular biennial session, and approved.

Section 1. Be it enacted by the People of the State of Illinois represented in the General Assembly: That an act entitled, "An act to provide for the licensing of architects, and regulating the practice of architecture as a profession," approved June 3, 1897, in force July 1, 1897, be and the same is hereby amended by amending Sections 2 and 11 so that the same may read, when so amended, as follows:

Sec. 2. The members of the State Board of Examiners of Architects shall, before entering upon the discharge of their duties, make and file with the Secretary of State the constitutional oath of office. They shall, as soon as organized and annually thereafter, in the month of January, elect from their number a president and secretary, who shall also be the treasurer. The treasurer, before entering upon his duties, shall file a bond with the Secretary of State for such sum as shall be required of him by said Secretary of State, and in such form and with such securities as may be approved by the Governor of the State. The board shall adopt rules and regulations not inconsistent with this act to govern its proceedings; and also a seal, and the secretary shall have the care and custody thereof; and he shall keep a record of all the proceedings of the board, which shall be open at all times to public scrutiny; and the board shall cause the prosecution of all persons violating any of the provisions of this act, and may incur necessary expenses in that behalf.

The secretary of the board shall receive a salary which shall be fixed by the board, and which shall not exceed the sum of fifteen hundred (1,500) dollars per year; he shall also receive his traveling and other expenses incurred in the performance of his official duties. The other members of the board shall receive the sum of ten (10) dollars for each day actually engaged in this service, and all legitimate and necessary expenses incurred in attending the meetings of said board. Said expenses shall be paid from the fees received by the board under the provisions of this act, and no part of the salary or other expenses of the board shall be paid out of the State treasury. All moneys received in excess of the said per diem allowance and other expenses provided for, shall be held by the treasurer as a special fund for meeting the expenses of said board, and the cost of an annual report of the proceedings of the State Board of Examiners of Architects. And any moneys that may have been heretofore paid into the State treasury to the credit of said board are hereby appropriated to the said board, to be held by it as a part of said special fund; and the Auditor of Public Accounts is hereby authoried to issue a warrant for their re-payment on the requisition of said board and the approval of the Governor, in such amounts as may from time to time be required.

Sec. 11. Every licensed architect in this State who desires to continue the practice of his profession shall, annually, during the time he shall continue in such practice, pay to the secretary of the board during the month of July a fee of five (5) dollars, and the secretary shall thereupon issue to such licensed architect a certificate of renewal of his license for the term of one year. Any licensed architect who shall fail to have his license renewed during the month of July in each and every year shall have his license revoked; and it shall be the duty of the secretary of the board to give notice of such revocation to the county clerk in each county in the State, whereupon the clerks of the counties shall make an entry of such revocation accordingly.

But the failure to renew said license in apt time shall not deprive such architect of the right of renewal thereafter; and the secretary of the board shall give like notice of such renewal; but the fee to be paid upon the renewal of license after the month of July shall be ten (10) dollars, to cover the additional expense incurred by the board on account of such notices.

LIST OF LICENSED ARCHITECTS.

Members of the Profession who will be Permitted to Practice in the State of Illinois.

This is to certify that I have examined the proofs of the list of Licensed Architects in the State of Illinois, made by the publishers of THE HANDBOOK FOR ARCHITECTS AND BUILDERS, and find that it agrees with the official list of Licensed Architects in this office.

Peter B. Wight

Secretary of the State Board of Examiners of Architects.

CHICAGO.

Abbott, Frank B., 810, 225 Dearborn St.
Adams, Charles R., 80 Dearborn St.
Adler, Abraham K., 64 Auditorium Bldg. (Treat & Adler.)
Ahlschlager, Frederick, 70 La Salle St.
Allison, Lyman J., 115 Dearborn St.
Alloway, Wilmore, 1551 Marquette Bldg.
Almquist, Carl M., 902, 112 Clark St.
Anderson, Peter W., 336 31st St.
Andresen, Theodor, 1335 Belmont Ave.
Artingstall, Samuel G., 240 Rialto Bldg.
Atchison, John D., 34, 90 Washington St.
Bacon, Francis T., 902, 1 Park Row (care I. C. R. R.).
Bannister, George S., 6436 Ingleside Ave.
Barfield, William G., 87 Washington St.
Barnes, Julian, 1225 New York Life Bldg.
Barrows, Allan M., 5233 W. Adams St.
Barton, Francis M., 801 Atwood Bldg. (Lowden & Barton).
Baumann, Frederick, 78 La Salle St.
Beauley, Wm. Jean, 1651 Monadnock Block (Peabody & Beauley).
Beaumont, George, 711, 115 Dearborn St.
Beers, Minard L., 508, 218 La Salle St.
Beiler, Henry P., 621 Oxford Bldg.
Belden, Edgar S., 68, 164 La Salle St.
Bell, Mifflin E., 84 Adams St.
Bell, Theodore N., 134 Van Buren St.
Beman, Solon S., 604 Pullman Bldg.
Bennett, Wm. A., 601, 85 Dearborn St.
Benson, Edward, 1416 Belmont Ave.
Berlin, Robert C., 1212 Tacoma Bldg.
Berndt, Francis J. J., 216 Seminary Ave.
Bessler, Edward W., 820 W. 12th St.
Beyer, Oscar, 56 Fifth Ave. (Oscar Beyer Company.)
Bicknell, A. H., 1538 Monroe St.
Bishop, Thomas R., 113 Adams St.
Blair, William Wallace, 2555 Magnolia Ave., Edgewater.
Blanchard, Frank R., Marquette Bldg.
Bloedner, Gustav, 630 Haddon Ave.
Blondin, Edward E., 5457 State St.
Bluemner, Oscar, 439 Unity Bldg.
Boari, Adamo, 1107 Steinway Hall.
Boller, Chester E., 6517 Minerva Ave.
Borst, George Henry, 1404, 100 Washington St.
Bowen, Howard, 912, 218 La Salle St.
Bowes, Frederick Wm., 1525 N. Central Park Ave.
Branitsky, Wm. Thomas, 701, 167 Dearborn St.
Braband, Frank J. E., 1459 Wrightwood Ave.
Bright, Jasper T., 2463 N. 42nd Ave.
Brinkman, Wm. J., 86 Metropolitan Block.
Brinsley, Herbert G., 237 S. Leavitt St.
Brodhag, Louis, 505, 84 La Salle St.
Brodhag, Louis, Jr., 911 Hamilton Ct.
Brompton, Joseph C., 604 Masonic Temple.
Brookes, William J., 3634 Vincennes Ave.
Brooks, Thos. M., (care Deering Harvester Company).
Brown, Henry, 5315 Wabash Ave.
Brueckner, Carl Louis, 309 E. North Ave. (Madlen & Brueckner.)
Brush, Charles E., 1654 Monadnock Bldg.

Brydges, Frederick T. C., 1832 W. Washington St.
Buck, Niels, 760, 125 La Salle St.
Buck, Lawrence, 920, 218 La Salle St.
Buckley, Ashbury W., 345 Wabash Ave.
Buerger, Albert, Jr., 1533 S. 42nd Ave.
Burnham, Daniel H., 1142 Rookery Bldg. (D. H. Burnham & Co.).
Burns, James, 185 Dearborn St.
Burtar, Adolph G., 1083 W. 12th St. (Burtar and Gassmann).
Butts, Julius A., 370 S. Paulina St.
Cady, Jeremiah Kiersted, 1002, 172 Washington St. (Handy & Cady).
Camp, Ervin M., 600 Fisher Bldg. (Murphy & Camp).
Carpenter, Martin R., 1212 Dunning St.
Carr, Martin, 618, 134 Van Buren St.
Charvat, Anton, 552 Blue Island Ave.
Chubb, John D., 112 Clark St.
Church, Myron H., 1234 Marquette Bldg.
Clarke, Edwin B., 1727 Wrightwood Ave.
Clay, William W., 218 La Salle St.
Cobb, Henry Ives, 100 Washington St.
Cobb, Oscar, 702, 85 Dearborn St.
Coddington, Vantyle W., 107 Dearborn St.
Coffin, Arthur S., 103 Randolph St. (Raeder & Coffin).
Colcord, Albert E., City Hall.
Cole, Arthur W., R. 715, 204 Dearborn St.
Colton, Samuel Kirk, 802 Reaper Block.
Coolidge, Charles A., Old Colony Bldg. (Shepley, Rutan & Coolidge).
Cowles, William D., Reaper Blk.
Cregier, Henry E., 175 Dearborn St.
Cutler, Wm. H., 4801 Kenwood Ave.
Crowen, Samuel N., 85 Dearborn St.
Danielson, John, 624 Alma St., Austin.
Davis, Zachary T., 1337 Unity Bldg.
Dawley, Wm. S., 355 Dearborn St. (Care of C. & E. I. Ry.)
Dean, Arthur R., 918, 218 La Salle St.
Dean, George R., 918, 218 La Salle St.
Demoney, Frank O., 141 S. Water St.
Denell, Reuben A., 320 Hampden Ct.
Devine, Nicholas S., 522 S. Wood St.
Dibelka, James B., 1315 W. 16th St.
Diethelm, Titus, 10242 Ewing Ave.
Doerr, John P., 1222 Chamber of Commerce Bldg. (J. F. & J. P. Doerr).
Doerr, Jacob F., 1222 Chamber of Commerce Bldg. (J. F & J. P. Doerr).
Dorr, John L., 7120 Langley Ave.
Dowling, Edward F., care of Patton. & Miller, Montauk Blk.
Drake, Wm. H., 112 Clark St.
Duesing, Theodore, 1293 W. 22d St.
Dunning, N. Max, 1218 Association Bldg
Dwen, Robert G., 3736 Ellis Ave.
Eckstorm, Christian A., 100 Washington
Egan, James J., 85 Dearborn St. (Egan & Prindeville.)
Eichberg, S. Milton, 300 Journal Bldg.
Eisendrath, Simeon B., 710 Fine Arts Bldg.
Emmons, Joseph N., 389 63d St.
Ender, Julius S., 355 Larrabee St.
Falls, Alexander S., The Rookery.
Fellows, Wm. K., 1733 Marquette Bldg. (Nimmons & Fellows.)
Ferree, Albert G., 6452 Union Ave.
Fielder, Fred A., 605 115 Monroe St.
Fischer, Frederick Wm., 9206 Commercial Ave.
Fischer, John B., 453 E. 59th St.
Fisher, Reynolds, 604 Montauk Block
Fisher, Albert J., 654 W. North Ave.
Flanders, John J., 1521 Masonic Temple.
Fletcher, Robert C., 172 Washington St.
Flizikowski, John Stanislaus, 1062 North Fairfield Ave.
Foehringer, Frederick, 168 Randolph St.
Foltz, Fritz, R. 42, 69 Dearborn.
Fortin, Joseph T., 7 Blue Island Ave.
Foster, John W., Union Stock Yards. (Care of Armour & Co.)
Foster, Arthur, 4310 Cottage Grove Ave.
Fowler, Geo. J., 5215 Kimbark Ave.
Frank, Joseph, 940 W. 51st Pl.
French, Ransford M., 1207 Monadnock Bldg.
Frommann, Emil H., 505 Schiller Bldg. (Frommann & Jebson).
Frost, Charles S., 806 The Temple. (Frost & Granger.)
Fry, Frank L., 42, 164 La Salle St.
Fuller, Alex A., 706 Journal Bldg. (Fuller & Stevens.)
Furst, Charles J., 172 Washington St.
Gall, Wm. F., 79 Dearborn St.
Garden, Hugh M. G., 1013 Teutonic Bldg.
Gardener, Horace C., Union Stock Yards (Care of Swift & Co.).
Garnsey, George O., 185 Dearborn St.
Gassmann, Andrew P., 1083 W. 12th St. (Burtar & Gassmann).
Gatterdam, Fred E., 163 Randolph St.
Gauger, Wm., 214 Milwaukee Ave.
Gaul, Hermann Joseph, 777 N. Irving Ave.
Gauntt, Newton C., R. 413, 134 Van Buren St.
Gay, Henry Lord, 92 Dearborn St.
Gerhardt, Paul, Schiller Bldg.
Gibb, William R., 169 Jackson Blvd.
Gibb, Wm., 525 Belden Ave.
Gilbert, George H., 367 E. 63d St.
Glattes, Frederick A., 16 Vernon Park Place.
Godfrey, Horace S., 502 Pullman Bldg.
Goodman, Wm. C., 1305 W. Adams St.
Gottig, Curd H., 1820 Wrightwood Ave.
Graham, Ernest R., 1142 Rookery Bldg. (D. H. Burnham & Co.).
Granger, Alfred Hoyt, 806 The Temple (Frost & Granger).
Griesser, Richard, 907 Schiller Bldg.
Grotz., Chas. J., 1254 N. Western Ave.
Grussing, George H., 425 Ashland Block
Gubbins, Wm. F., 685 Ogden Ave.
Guenzel, Louis, 1601 Ashland Block.
Hale, Perley, 607 Atwood Bldg.
Hall, E. Stanford, 918, 153 La Salle St.
Hallberg, L. Gustav, 812 Oxford Bldg.
Hallstrom, Nils, 929 Roscoe St.
Hamilton, John L., 4720 Madison Ave.
Hand, Fred L., 2066 Lexington St.
Handy, Frank W., 1002, 172 Washington St. (Handy & Cady).
Hansen, Christian O., 37, 92 La Salle St.

Hansen, Harald M., 88 La Salle St.
Hansen, Paul, 804 Illinois Bank Bldg.
Harned, Henry P., 218 La Salle St.
Harvey, George L., 406, 115 Monroe St.
Haskins, James H., 1002 S. Ridgeway Ave.
Hatzfeld, Clarence, 804, 172 Washington St. (J. H. Huber & Co.)
Hays, Harvey G., 1300 Michigan Ave.
Hazelton, Herbert T., 1800 Fisher Bldg. (Watson & Hazelton.)
Hecht, Albert S., 96, 163 Randolph St.
Heidenreich, E. Lee, Rookery Bldg.
Herez, Arthur, Ashland Blk.
Hermann, Chas. F., 36 Sigel St.
Hessenmueller, Frank W., 225 Dearborn St. (Hessenmueller & Meldahl).
Heinz, Lorenz H., 78 La Salle.
Hellick, Chauncey G., 203 Washington St.
Hetherington, John T., 1404, 100 Washington St.
Hettich, Albert H., 56 Wells St.
Hettinger, John P. Journal Bldg.
Heun, Arthur, 1300, 355 Dearborn St.
Higgins, Francis J., 1423 N. Clark St.
Higginson, Augustus Barker, 164 La Salle St.
Hill, Henry W., 22, 70 La Salle St. (Hill & Woltersdorf.)
Hine, Cicero, 263 Wabash Ave.
Hodgkins, Howard G., 115 Monroe St.
Hoffman, H. Curtis, 6636 Lexington Ave.
Hogenson, Edward A., 264 N. Hoyne Ave.
Holabird, Wm., 1618 Monadnock Block (Holabird & Roche).
Holmboe, Leonard C. B., 7535 Saginaw Ave.
Holsman, Henry K., 1118, 153 La Salle St.
Hoskins, John M., 1280 Madison St.
Hotchkin, Robert B., 2846 Hermitage Ave.
Houda, Joseph F., 879 W. 19th St.
Huber, Julius H., 172 Washington St. (J. H. Huber & Co.)
Huehl, Harris W., 59, 163 Randolph St. (Huehl & Schmid).
Hughes, Andrews F., 429 W. 69th St.
Hulla, John, 709, 84 La Salle St.
Hunt, Jarvis, 1407 Monadnock Block.
Hunt, Myron, R. 850, 123 La Salle St.
Hussander, Arthur F., 536 Seminary Ave.
Hyde, Frank D., 163 Randolph St.
Ingalls, Arthur R., 6558 Ross Ave.
Jebsen, Ernest, 505 Schiller Bldg. (Frommann & Jebsen.)
Jenney, Wm. Le Baron, 520 New York Life Bldg. (Jenney & Mundie).
Jobson, C. Frank, Pullman Bldg.
Johnson, Oscar, 1066 Seminary Ave.
Johnson, Morris O., 6530 Lexington Ave
Johnston, Joseph S., 359 E. 43d St.
Johnston, Wm. K., 189 La Salle St.
Jyrch, Carl E., 696 Fulton St.
Kaeseberg, Frank, 770 Sheffield Ave.
Kaiser, August, 428 S. California Ave.
Kaiser, Otto, 75 Bingham St.
Kallal, Chas. W., 620 Roanoke Bldg. (Lonek & Kallal.)
Karback, Charles W., 1490 Ogden Ave.
Kelley, Irving W., 59 Dearborn St.
Kennard, Dewitt Taylor, 1040 Unity Bldg.
Kennerly, George H., Union Stock Yards (Care of Armour & Co.)
Kiehmel, Richard, R. 86, 163 Randolph.
Kilroy, John G., 1210 Tacoma Bldg.
Kingsley, George S. 404, 103 Randolph St.
Kintz, Geo. A. W., 9710 Logan Ave.
Kirkpatrick, Francis W., 1107 Steinway Hall.
Klewer, Wm. L., 1505 Schiller Bldg.
Kley, Henry T., 214 Milwaukee Ave. (Kley & Lang.)
Klucina, John, 1618 22nd St.
Knapp, George O., 157 Michigan Ave.
Knudson, Johan F., 801 W. North Ave.
Koenig, Fred, 1656 Greenshaw Ave.
Koll, Henry C., 598 Sheffield Ave.
Koster, John L., 358 24th St.
Krausch, Walter T., 205 Adams St. (Care of C. B. & Q. Ry.)
Krause, Edmund R., 1601, 100 Washington St.
Krieg, Wm. G., 84 Washington St.
Kuehne, Carl Oskar, 171 Center St.
Kupfer, Otto A., 371 S. Paulina St.
Kutsche, Arthur W., 1601, 315 Dearborn St.
La Belle, Edward C., 607 Thomas St.
Lang, Fritz, 700 Milwaukee Ave. (Kley & Lang.)
Lang, Louis A., 2611 N. 41st Ct.
Langtry, Wm., 825 Reaper Block.
Lapointe, Diendonne A., 810 Security Bldg.
Larmon, Philip, 89 Lake St.
Lehle, Louis, 812 Schiller Bldg.
Lewis, William C., 616, 269 Dearborn St.
Levy, Alexander L., R. 715, 100 Washington St.
Levy, Samuel H., 1733 Marquette Bldg.
Lewandowski, Theo., 828 Schiller Bldg.
Liedberg, Hugo J., 91 Dearborn St.
Linderoth, Sven, 5844 Elizabeth St.
Lindquist, Frederick, 1408 Central Blvd.
Llewellyn, Joseph C., 1218 Association Bldg.
Lonek, Adolph, 620 Roanoke Bldg. (Lonek & Kallal.)
Lovell, Sidney, 1300, 355 Dearborn St.
Lowden, Alexander H., 801 Atwood Bldg. (Lowden & Barton.)
Luebkert, Otto, 65 S. Clinton St.
Luce, Wm. G., 112 Clark St.
Lund, Anders G., 602 W. 63d St.
Macdonald, Frederick J., 806 W. 63rd Court.
Madlen, Thomas J., 912 W. North Ave. (Madlen & Brueckner.)
Mahaffey, David, 711, 84 La Salle St.
Maher, George W., R. 820, 218 La Salle St.
Mahoney, Marion L., 281 W. Adams St.
Marble, Oliver Wm., 916 Stock Exchange Bldg.
Marshall, Benjamin H., 908, 218 La Salle St. (Wilson & Marshall).
Marston, Louis H., 908, 187 Dearborn St.
Matz, Otto H., 78 La Salle St.
Maurer, Wm., 668 Augusta St.

Mayo, Ernest A., 127 Hartford B dg.
McCall, Thomas, 167 Dearborn St.
McMichael, John, 6030 Calumet Ave.
McMullen, Henry J., 1680 W. 12th St.
McMurray, Oscar L., 6441 Greenwood Ave.
Mead, Daniel W., 605 First National Bank Bldg., 164 Dearborn St.
Meissner, C. L. Henry, 92 N. Central Park Ave.
Meldahl, Jens J., 801, 225 Dearborn St. (Hessenmueller & Meldahl.)
Metcalf, John S., 1075 W. 15th St.
Miller, Jos. A., 1607 Ashland Block.
Miller, Grant C., 605 Montauk Block. (Patton, Fisher & Miller.)
Miller, Wm. C., 1992 W. Madison St.
Milner, Warren H., 1233 Stock Exchange Bldg.
Mitchell, Louis M., 145 La Salle St.
Molitor, Joseph, 1209, 153 La Salle St.
Morehouse, Merritt J., 1204, 226 La Salle St.
Morey, Arthur G., 70 Metropolitan Blk.
Morrell, John, 13 Surrey Ct.
Morrison, John C., 78 La Salle St.
Mosher, E. Bradford, 530 W. 58th St.
Moulton, Geo. M., 1809 Fisher Bldg.
Mueller, Herman, 561 So. Ashland Ave.
Mullay, Thomas Hubert, 1601 Monadnock Block.
Mundie, Wm. Bryce, 520 New York Life Bldg. (Jenney & Mundie.)
Murphy, John H., 600, 279 Dearborn St. (Murphy & Camp.)
Naess, Ivor V., 632 Wells St.
Neebes, Geo. S., 4016 Wentworth Ave.
Niemz, Arthur R., 1107 Steinway Hall.
Nelson, Edward O., 1117 Schiller Bldg.
Nettenstorm, Joel U., (R. 1100, Care C., M. &, St. P. R. R.), 84 Van Buren St.
Newhouse, Henry L., 4630 Prairie Ave.
Newhall, Frank V., 343 5th Ave.
Newberry, Robert T., 1227 New York Life Bldg.
Newman, Edgar M., 515 Stock Exchange.
Newman, Wm. L., 909 Jackson Blvd.
Newport, Chas. F., 433 Flournoy Ave.
Nicholson, Wm. A., 6112 Lexington Ave. (J. T. Nicholson & Son.)
Nicholson, Jos. T. & Son, 6112 Lexington Ave. (J. T. Nicholson & Son.)
Nimmons, George C., 1733 Marquette Bldg. (Nimmons & Fellows.)
Noble, Charles W., Union Stock Yds., care Armour & Co.
Norton, Francis Joseph, Edgewater Park, Ill.
Nothnagel, Charles W., 185 Dearborn St.
Novy, Ludvig, 1343, 22d St.
O'Brien, Maurice G., 122 Randolph.
Ohlhaber, Wm., 663 N. Robey St.
Otis, Wm. A., 606, 175 Dearborn St.
Ottenheimer, Henry L., 1201 Fort Dearborn Bldg.
Packard, Allyn A., 1706 Marquette Bldg.
Pagels, Wm. F., 404, 91 Dearborn St.
Palmer, Charles M., 1205 Monadnock Block.
Pashley, Alfred F., 1605 Manhattan Bldg., 315 Dearborn St. (Willett & Pashley.)
Patton, Normand S., 605 Montauk Block. (Patton & Miller.)
Peabody, Arthur, 1649 Monadnock Block. (Peabody & Beauley.)
Pentecost, D. S., 1013 Adams Express Bldg.
Perkins, Frederick W., 906, 115 Monroe St.
Perkins, Dwight Heald, 1107 Steinway Hall.
Pfeiffer, George L., 1168 W. 12th St.
Pierce, Osborne J., 2163 Monroe St.
Pistorius, Henry, 1662 Melrose St.
Pond, Allen Bartlit, 1109 Steinway Hall. (Pond & Pond.)
Pond, Irving K., 1109 Steinway Hall. (Pond & Pond.)
Pope, John Francis, 874 W. Adams St.
Postle, David E., 1731 Marquette Bldg.
Paulsen, Edward J., 594 N. Francisco St.
Poulsen, Geo. F., 302 E. 41st St.
Powell, Russell B., 8 Best Ave.
Poyer, Andrew, 10536 Vincennes Road. (A. Poyer & Son.)
Poyer, Max, 10536 Vincennes Rd. (A. Poyer & Son).
Pridmore, John E. O., 1418 Champlain Bldg.
Prindeville, Chas. H., 85 Dearborn St. (Egan & Prindeville.)
Probst, Edward, 990 W. 20th St.
Pruyn, Wm. H., Jr., 229, 42d St.
Purssell, George G., 1311 W. Madison St
Quackenboss, Leonard G., 108 Fifth Ave.
Rae, Robert, Jr., 525, 134 Van Buren St.
Raeder, Henry, 103 Randolph St. (Raeder & Coffin.)
Randak, Frank, 1314 Ashland Block.
Randolph, Smith Martin, 866 Sawyer Ave.
Rapp, Cornelius Ward, 615, 100 Washington St.
Rautert, Fred., R. 99, 163 Randolph St.
Rawson, Lorin A., 806 The Temple.
Renwick, Edward A., 1618 Monadnock Block. (Holabird & Roche.)
Reynertson, Theis J., 1085 N. 40th St.
Rezny, James B., 1185 Turner Ave.
Rich, Evert, 445 W. 65th St.
Richards, Henry H., R. 823, 134 Van Buren St.
Riegert, Emil, 74 Racine Ave.
Rinn, Charles, 913 N. Hoyne Ave.
Ritter, Louis E., 1837 Aldine Ave.
Robinson, Argyle E., 622, 84 LaSalle St.
Roche, Martin, 1618 Monadnock Block. (Holabird & Roche.)
Rogers, John Arthur, 1219 Ashland Block.
Rogers, James Gamble, 1314 Ashland Block.
Rohm, Jean Baptist, 360 Armitage Ave
Rosenthal, Alexander B., 163 Randolph St.
Roy, Franz, 275 92d St.
Runde, Otto, 119 Rice St.
Rusy, Anthony F., 930, 112 Clark St.
Rutan, Charles H., 1780 Old Colony Bldg. (Shepley, Rutan & Coolidge.)
Sandegren, Andrew, R. 1022, 185 Dearborn St.
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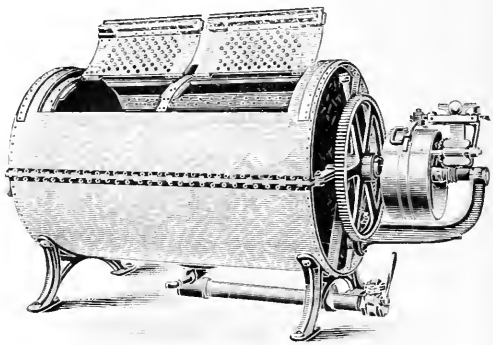

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Schmidt, Richard Ernest, 1013, 172 Washington St.
Schock, Frederick R., 913, 172 Washington.
Schoenfeldt, Frank, 1755 W. 12th St.
Schroeder, Wm. H., 780 S. Kedzie Av.
Schroeder, John M., 180 S. Kedzie Ave
Schuberth, George F., 568 Sheffield Ave.
Schultz, Martin M., 678 W. 17th St.
Schulze, William, 1022 N. Western Ave.
Seator, Sinclair M., 630, 225 Dearborn St.
Shankland, Edward Clapp, 816 Rookery Bldg.
Shaw, Howard Van Doren, 406, 115 Monroe St.
Shattuck, Walter F., Art Institute.
Shepley, George F., 1780 Old Colony Bldg. (Shepley, Rutan & Coolidge.)
Shipman, Stephen V., 218 La Salle St.
Sierks, Henry R., 69 Dearborn St.
Silsbee, Joseph L., 1435 Marquette Bldg.
Simpson, John G., 115 Dearborn St.
Smith, Robert S., 818, 185 Dearborn St.
Smith, Sidney, 1618 N. Clark St.
Snyder, Edward E., 39 Stanley Terrace.
Sorensen, Charles A., 648 N. Claremont St.
Spencer, Robert C., Jr., 1107 Steinway Hall.
Speyer, Julius, 164 La Salle St. (J. Speyer & Son.)
Speyer, Oscar P., 164 La Salle St. (J. Speyer & Son.)
Spitzer, Maurice, 315 Dearborn St.
Stanhope; Leon E., 1201 The Temple.
Stebbings, Walter L., 1111 Monadnock Bldg.
Stephens, Burett H., 5729 La Salle St.
Steuben, Theo., 1110 Lincoln Ave.
Stevens, Charles Whitney, 706 Journal Bldg. (Fuller & Stevens).
Stevens, Harry E., 204, 100 Washington St.
Stiles, Clarence L., 123 Hartford Bldg.
Stoddard, Edward B., 1480 Madison St.
Stone, John R., 76 Hartford Bldg.
Strandel, Charles A., 713, 84 La Salle St.
Strippleman, Wm., 927, 153 La Salle St.
Sturm, Meyer J., 818, 84 La Salle St.
Sturnfield, Chas. H., 1238 W. 21st St.
Sullivan, Louis H., 1600 Auditorium Bldg.
Sutcliffe, John, 218 La Salle St.
Swanson, H. Frederick., 1216 Milwaukee Ave.
Swern, Wm. C., 426, 97 Clark St.
Thain, Joseph A., 3152 Prairie Ave.
Thisslew, Charles, 451 Milwaukee Ave.
Thomas, Wm., 163 Randolph St.
Thomsen, Frederick W., 46 Seminary Ave.
Thomson, James Young, 4430 Sherman St.
Tilton, John Neal, R. 1024, 112 Clark St.
Tomlinson, Henry Webster, 1107 Steinway Hall.
Townsend, Frederick B., 903, 234 La Salle
Treat, Samuel A., 1507 Fisher Bldg. (Treat & Adler.)
Turnock, E. Hill, 1331 Masonic Temple.
Vail Morrison H., 1128 Unity Bldg.
Van Keuren, Charles W., 505, 125 La Salle St.
Van Keuren, Wm. J., 14, 78 La Salle St.
Van Osdel, John Mills, 225 Dearborn St.
Voigt, Gustav, 3220 S. Canal St.
Waful, Edward E., 172 Washington St.
Wagner, John H., 107 Dearborn St.
Walker, Wm. Ernest, 100 Pine St.
Warren, Clinton J., 906, 134 Monroe St.
Waterman, Harry Hale, 218 La Salle St.
Watson, Robert Bruce, 1800 Fisher Bldg. (Watson & Hazleton.)
Weary, Chas. A., 412 So. Paulina St.
Weber, Alfred P., 172 Washington St.
Weber, Peter J., 702 Fisher B'dg.
Wegman, Jules F., 571 N. Clark St
Westberg, Per August, 363 67th St.
Wheelock, Harry B., 1103, 226 La Salle St.
Whittlesey, Chas. F., 29, 90 La Salle St.
Wierzbieniec, Jean A., 7 Blue Island Ave.
Wight, Peter B., 1112 Chamber of Commerce Bldg.
Wilcox, Elbert F., 78 La Salle St.
Wilkowski, Jos. A., 1177 N. Leavitt St.
Willett, James R., 1605 Manhattan Bldg. (Willett & Pashley.)
Williamson, William G., 1124, 153 La Salle St.
Wilmanns, August C., 402 Journal Bldg.
Wing, Thomas W., 204 Dearborn St.
Wilson, Horatio R., 900, 218 La Salle St. (Wilson & Marshall.)
Witherspoon, John M., 1809 Fisher Bldg.
Wittekind, Henry, Jr., 944 Fargo Ave.
Woerner, Adolph, 217 Centre St.
Wolf, Frederick W., 139 Rees St.
Woltersdorf, Arthur F., 22, 70 La Salle St. (Hill & Woltersdorf.)
Woollacott, John S., 1022 Chicago Opera House.
Worthmann, Henry, 625 W. Chicago Ave.
Wray, James A., 591 W. North Ave.
Wright, Harvey, 1100, 226 La Salle St.
Wright, Henry G., 4817 N. Clark St.
Youmans, Louis J., 7011 Jefferson Ave.
Youmans, Wm. A., Champlain Ave. and 47th St.
Youngberg, John E., 218 La Salle St.
Zarbell, Iver C., 528 Reaper Block.
Zimmerman, W. Carbys, 618 Steinway Hall.
Zimmermann, Hugo H., 1279 Perry St.
Zimmermann, Albert G., 115 Monroe St.

COOK COUNTY OUTSIDE OF CHICAGO.

EVANSTON.

Ayars, Charles R., 605 Davis St.
Blake, Edgar O., 7, 620 Davis St.
Childs, Frank A., 1203 Maple Ave.
Matteson, Victor Andre, 1030 Davis St.
Phillips, Charles A., 228 Greenwood Bd.
Stewart, Peter C., 1603½ Orrington Ave.

OAK PARK.

Wright, Frank Lloyd.
Fiddelke, Henry G., 115 Erie St.

Fyfe, James L., 417 Home Ave.
Roberts, Eben Ezra, 101 Marion St.
Thompson, Frank D., 111 Marion St.
Thomas, Cyrus P., The Kenton.

RIVERSIDE.

Ashby, Geo. Wm.

WILMETTE.

Wright, Willis J., 1326 Forest Ave.

WINNETKA.

Windes, Frank A.

CITIES OUTSIDE OF CHICAGO AND COOK COUNTY.

ALHAMBRA (Madison Co.)

Oswald, Fridolin, Main St.

ALTON (Madison Co.)

Nixon, Utten S., Cor. Bell and Third Sts.
Pfeiffenberger, Lucas, 102 W. 3d St.
Stelle, Oliver G., Upper Alton.
Marland, Andrew S.

ATKINSON (Henry Co.)

Chapler, Elijah C.
Milar, Wallace L.

AURORA (Kane Co.)

Malmer, Eugene, 249 Grove St.
Mulvey, Joseph, S Brady Block.
Shepardson, Ralph S., 204 Galena St.
Worst, Frederick W., 320 Coulter Block.

BELLEVILLE (St. Clair Co.)

Rubach, Otto W., Court House.

BELVIDERE (Boone Co.)

Sturgis, Louis H., 810 N. State St.

BLOOMINGTON (McLean Co.)

Bullard, Robert A.
Dillon, Wm. Henry, 212 Seminary Ave.
Miller, George H., Eddy Bldg.
Moratz, Paul O., 101 E. Front St.
Pillsbury, Arthur L., 616 Griesheim Bldg.

CAIRO (Alexander Co.)

Jenkins, John S., 1006 Commercial Ave.
Kelly, Daniel M. (Kelly & Kusener.)
Kusener, Casper, 1916 Commercial Ave. (Kelly & Kusener.)

CARTHAGE (Hancock Co.)

Payne, Edgar A. (Geo. W. Payne & Son.)
Payne, Geo. W. (Geo. W. Payne & Son.)

CHAMPAIGN (Champaign Co.)

Bainum, Curtis S., 34 Neil St.
Brown, Seeley, 70 N. Neil St.
Hines, Edward G., News Bldg.
Ice, Mel Dora, 511 E. University Ave.
Spencer, Nelson S., I. O. O. F. Bldg.
Teeple, Wallace D., 501 Wright St.
Temple, Harry R., 309 Springfield Ave.
Vredenburg, Hachaliah, News Bldg.

CHARLESTON (Coles Co.)

Maxwell, Benj. R., 411 Harrison Ave.
Mitchell, Chas. D., 16, 6th St.

COLLINSVILLE (Madison Co.)

Eberhardt, Henry W., 207 E. Main St.

DANVILLE (Vermillion Co.)

Brown, Frederick G., 405 Kimbrough Platt Bldg.
Lewis, Chas. M., 110 N. Vermillion St.
Liese, George C.
McCoy, John F., Kimbrough-Platt Bldg.
Whitmeyer, Mark H., 15 N. Vermillion St.
Blackburn, M. F., 905 Bowman Ave.

DECATUR (Macon Co.)

McNabb, Willie O., 403 N. Main St.
Babcock, Barzillia B., 770 Johns Ave.
Patterson, Mellville G., 152 Prairie St.
Rosen, Richard O., 367 N. Main St.

EAST ST. LOUIS (St. Clair Co.)

Barthlow, James N., Cor. Main and Division Sts.
Frankel, Albert B., 208 Collinsville Ave.
Kennedy, John W., 1st National Bank Bldg.
Mueller, Bernhard A., 133 N. Third St.
Pfeiffenberger, George D., First National Bank Bldg. (L. Pfeiffenberger & Son.)
Ruester, Frank P., 703 Missouri Ave.

EDWARDSVILLE (Madison Co.)

Pauly, Edward C., Hillsboro Ave.
Pauly, Charles, Hillsboro Ave
Spilman, Charles H.

ELGIN (Kane Co.)

Abell, Wm. Wright, Home Bank Bldg.
Elliott, W. E., 34 River St.
Hoag, Smith, 36 Union St.
Jones, Wm. C., McBride Block. (Turnbull & Jones.)
Turnbull, Gilbert M., McBride Block. (Turnbull & Jones.)

FARMER CITY (De Witt Co.)

McKean, Randolph W.

FREEPORT (Stephenson Co.)

Weary, Arthur C., 141 Stephenson St.

GALESBURG (Knox Co.)

Aldrich, Norman K.
Beadle, John Grant, 207 Main St.
Hair, Charles Ernest, 16 E. Main St.
Klein, Frederick J., Fraternity Bldg.
Wolf, William, Fraternity Bldg.

GENESEO (Henry Co.)

Okeberg, John V.

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Kistner, Theodore C. (Hill & Kistner.)

HINSDALE (Du Page Co.)

Shannon, James S., Cor. Third and Grant Sts.

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Buckingham, Nathan A., 211½ State. Bldg. (N. A. Buckingham & Son.)
Coleman, Isaac C., 232½ W. State St.
Pierson, James K. C., 123 S. Adams St.

JERSEYVILLE (Jersey Co.)

Embley, Augustus N., Arch St.

JOLIET (Will Co.)

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Barnes, John H., 30 Young Bldg.
Boehme, Hugo, 101 Ottawa St.
Cowell, Herbert, 329 Jefferson St.
Hoen, Rudolph G., 212 Allen Bldg.
Wallace, Charles L., 101 Wallace Bldg.
Wallace, Elizabeth B., 101 Wallace Bldg.
Webster, Charles Woods, 400 Cutting Bldg.

KANKAKEE (Kankakee Co.)

Henry, Charles D., 26 Arcade Bldg.

KEWANEE (Henry Co.)

Eklund, Henry, 218 N. Fremont St.
McCullough, John, 107 Third St.

LINCOLN (Logan Co.)

Corwine, William A., 203 4th St.
Deal, Joe Jindert, 4 Obcamp Block.
Simpson, John A., 109 Chicago St.

MACOMB (McDonough Co.)

Fuhr, John H., 209 Calhoun St.
Holmes, Willis B., Calhoun and Carroll Sts.

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Skadden, Edward W.

METROPOLIS.

Houts, Wm. H.

MILLEDGEVILLE (Carroll Co.)

Ruth, Thomas P.

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White, Kesson, 6 Masonic Block.

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Hewitt, Herbert Edmund, 24 Arcade Bldg.
Hotchkiss, Robert J., 109 So. Jefferson St. (Richardson & Hotchkiss.)
Hulsebus, Bernhard L., 514 Y. M. C. A. Bldg. (Parr & Hulsebuss.)
Jobst, Valentine, 517 N. Adams St.
Kiefer, Albert, 217 So. Adams St.
Parr, Louis J., 514 Y. M. C. A. Bldg. (Parr & Hulsebus.)
Pierson, James K., 123 S. Adams St.
Reeves, Wm. H., Y. M. C. A. Bldg. (Reeves & Baillie.)
Shank, John A., Observatory Bldg.
Todhunter, Robinson L., 818 Fifth Ave.
Zeitz, Ferdinand M., 938 Warner Ave.

PONTIAC (Livingston Co.)

Hercules, Jacob W., 726 Howard St.

PRINCETON (Bureau Co.)

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Bryant, Joseph P.

QUINCY (Adams Co.)

Batschy, John, Wells Bldg.
Behrensmeyer, George A., 530½ Main St.
Chatten, Harvey, Fifth and Main Sts.
Ledebrink, Frederick C., 615¼ Hampshire St.
Orr, Edward Elsworth, 133½ N. 6th St.
Tubbesing, Frank R., 651½ Hampshire St.
Wood, Ernest M., 7th and Hampshire Sts.

ROCK ISLAND (Rock Island Co.)

Borgolte, Frederick Ferdinand, Mitchell & Linde Bldg.
Drack, Leonard, 18th St. and Second Ave. (Drack & Kerns.)
Kerns, George M., 18th St. and Second Ave. (Drack & Kerns.)
Staudnhar, George P., 320 20th St.

ROCKFORD (Winnebago Co.)

Bradley, Charles W., 226 S. Main St. (Bradley & Carpenter.)
Carpenter, Frank A., 226 S. Main St. (Bradley & Carpenter.)
Schureman, David S., Masonic Temple.

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SANDWICH (De Kalb Co.)

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Foster, Wm. F., 615 S. 5th St.
Furrow, Edward, 1124 So. 4th.
Hamilton, Frank H., City Hall.
Hanes, Samuel J., Farmer's Bank Bldg.
Helmle, George Henry, 430 S. 5th St.
Rinaker, John I., Franklin Bldg.
Shinn, Charles W., 714 S. 5th St.

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Cregar, J. Frank, Main and Park Sts.
Laughlin, John A., Leroy Block.

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Hanker, Charles.

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Ricker, N. Clifford, 400 Engineering Bldg. U. of I. (Ricker & White.)
Royer, Joseph W., 115 S. Race St.
Temple, Seth Justin, Engineering Hall. U. of I. (McLane & Temple.)
White, James M., 400 Engineering Hall. (Ricker & White.)

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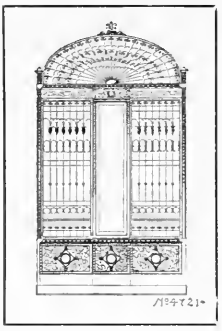

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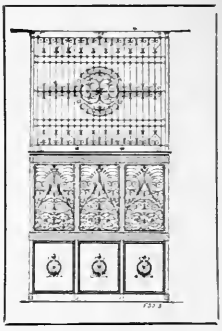

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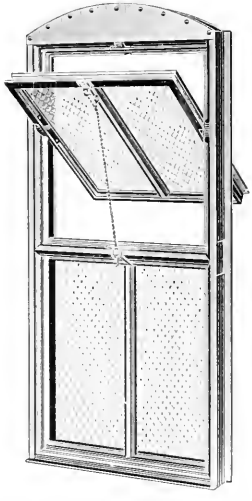

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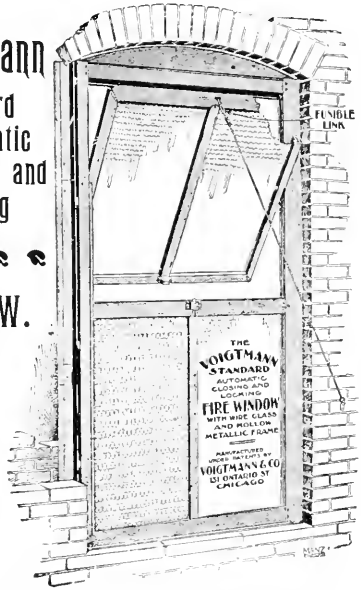

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INTRODUCTION.

The following rules are the expression of a custom founded in equity and prevailing in this city from its earliest days:

If to furnish and lay one thousand brick in a plain dead wall cost $10, another piece of brickwork of equal cost must be measured as of the same contents, even though it does not take one-fourth as many brick.

The plain dead wall, in stone as well as brick work, is taken as the standard, and the more difficult, complicated, ornamental and hazardous kinds of work are measured up to it, so as to make the compensation equal. To illustrate: If in one day a man can lay two thousand brick in a plain dead wall, and can lay only five hundred in a pier or arch in the same time, the cost of labor per thousand in such work is four times as much as in a wall, and he is entitled to extra compensation; but instead of varying the price, the custom varies the measurement to compensate for the difference, and thus endeavors to secure a uniform price per thousand for all descriptions of ordinary brickwork, instead of a different price for the execution of the various kinds of work.

This is the principle underlying the system.

If any new rules or new applications of old rules should be found in the following, we can only say in their recommendation that we have carefully considered them in all their bearings, endeavoring to secure equal justice to owner as well as contractor, and that they will form the standard for deductions as well as for compensation for extra work.

The units of measurement of mason's work are:

For excavation, the cubic yard.
For concrete, foundations, the cubic foot.
For concrete, floors, the superficial foot.
For dimension stone, footings, the superficial yard.
For dimension stone, bridge masonry, the cubic foot.
For dimension stone, surface dressing, the superficial foot extra.
For rubblework, the cubic foot.
For rubblework, surface dressing, the superficial foot extra.
For brickwork, common, the thousand brick.
For brickwork, pressed, the superficial foot.
For tuckpointing, cleaning fronts, the superficial foot.
For plastering, plain surfaces, the superficial yard.
For plastering, cornices, the running and superficial foot.

EXCAVATION

to be measured and computed by the actual amount of material displaced—no allowance for rehandling.

CONCRETE.

FLOORS.

Foundations—Measure actual contents.

Floors to be measured by the superficial foot of surface between walls.

No deduction for tile drains, nor for any pier, chimney breast, plaster or other rojection of walls of ten feet or less in area.

DIMENSION STONE.

FOOTINGS.

Footings to be measured each course separately—no deductions for drain or ther openings under walls two feet or less in width.

Bridge Masonry—Compute actual cubic contents.

Surface dressing of all kinds, extra.

RUBBLE WORK.

Footings to be measured by actual cubic contents.

Note.—Footings are all such foundation courses, not exceeding sixteen inches ı height each, as are wider than the body of the above.

Note.—In the following the term Corner is used for salient angles of walls, and ıngle for re-entering angles.

EXTERNAL WALLS.

Girt building and add thickness of wall for each external angle.

PARTITION WALLS.

Intersection of partition walls two feet or less in width to be measured double; ' wider, add four cubic feet to actual contents of every intersection for each foot ı height.

BEVELED CORNERS.

For each corner of wall more or less than ninety degrees, add one foot six inches o length of wall.

CIRCULAR WALLS.

For round walls add one-fifth of girt measure.

PILASTERS, ETC.

All projections, such as chimney breasts, piers connected with walls, and ilasters, to be measured actual cubic contents contained therein, and one cubic foot dded thereto for each corner for every foot in height.

PIERS.

Independent square piers to be measured by the same rule.

Polygon and round pier work at special rates.

RECESSES, ETC.

Recesses and slots to be measured solid, and in addition thereto allow one cubic oot for every foot in height.

ARCHES.

Stone arches are classed as cut-stone work.

OPENINGS.

Deduct contents of windows, doors and other openings, measuring from top of sill to spring of arch, and add two feet of wall for each jamb for every foot in height of opening.

No deductions are to be made for cut-stone trimmings and lintels.

BRICKWORK.

Note.—Different cities make different bricks; in reality the products of no two brickyards are entirely alike in size, nor, for that matter, all brick burned in the same kiln. The necessity of acknowledging some standard for purposes of mensuration and calculation is obvious. In these rules the dimensions of a brick are understood to be 2 by 4 by 8 inches. We therefore speak of 4-inch walls, meaning the width of one brick; of 8 inch, meaning the width of two bricks, and of 12 inch walls, meaning the length of one and width of another brick, etc., although the actual width of wall will be more of less in excess of these measures.

Every superficial foot of "one-half brick (or 4 inch) wall" to be estimated at seven and one-half bricks; of "one brick (or 8-inch) wall" at fifteen bricks; of "one and one-half brick (or 12-inch) wall" at twenty-two and one-half bricks; of "two brick (or 16-inch) wall" at thirty bricks, etc.—increase the number of brick by seven and one-half for every additional half-brick in thickness of wall.

EXTERNAL WALLS.

If sixteen inches thick or less, girt building and add thickness of wall for each external angle.

When thicker, add to actual contents of each corner one and one-half cubic feet for every foot in height.

Allow for wall ends as for corners.

ROUND WALLS.

Sixteen inches thick or less.

For circular walls, of radius sufficiently large to obviate the necessity of using specially molded or cut brick, add one-fifth of length to girt.

When thicker, allow for sixteen inches of such wall as per above rule, and measure all in excess as straight work.

Cut or molded work at special rates.

BEVELED CORNERS.

For each corner of wall of more or less than ninety degrees, add one foot six inches to length of girt.

PARTITION WALLS.

Sixteen inches thick or less. Intersections of partition walls (bonded together in any manner—not abutting) to be measured double.

When thicker, add one and one-half cubic feet to actual contents of every intersection for each foot in height.

Partition walls connecting with stone walls to be measured one foot into such wall.

CHIMNEY BREASTS AND PILASTERS.

All flues and hollows in chimneys four feet or less in area to be measured solid.

When larger, deduct one-half contents of flue.

For all chimney breasts and pilasters add eight inches to face for each corner and multiply length so obtained by width (projection).

Detached chimneys in buildings and plain chimney tops to be measured solid and one-half of one cubic foot to be added for each corner for every foot in height.

STACKS.

Chimney stacks at special rates.

When square, find cubic contents, measuring hollow walls solid, and deducting flue.

When round or octagon, take length of diameter for side, and measure as though it was square.

PIERS.

Independent piers to be measured like chimneys.

HOLLOW WALLS.

Hollow walls to be measured solid.

STONE FRONTS.

Stone fronts backed with brickwork. Deduct thickness of ashlar from width and figure like ordinary walls.

GABLES AND WALL TOPS.

Whenever clipping of brick is required, add to actual contents the length of line of clipping by one foot by thickness of wall.

CORNICES AND BELTS.

If of running courses only, multiply length by height (greatest girt in the cut) by greatest projection.

If enriched (by corbels, brackets and panels), multiply other dimensions, as given, by greatest girt length.

LEDGES.

Multiply length by height by greatest projection.

PROJECTIONS.

All other projections, if of four inches or less, to be measured four inches; if above four inches, and not exceeding eight inches, to be measured eight inches; if above eight inches, and not exceeding twelve inches, to be measured twelve inches, etc.

GAUGE WORK.

Gauged work at special rates.

OPENINGS.

Openings to be measured from top of sill to spring of arch and shortest distance between brick jambs for width.

No deductions to be made for openings two feet six inches or less in width.

One-half of contents to be deducted of openings from two feet six inches to six feet in width.

For openings of more than six feet in width allow one foot six inches by thickness of wall by height for each jamb.

SLOTS, PANELS, ETC.

No deduction to be made for slots, chases, niches, panels or other recesses of four feet or less in width; if wider, deduct contents, and add two cubic feet of wall for every foot in height.

TRIMMINGS.

No deductions in measuring brickwork for cut-stone or other trimmings, bond-blocks, timber, joists or lintels.

ARCHES.

Arches—not gauged.

In vaults: multiply length of chord at spring of arch by height from chord to extrados by thickness of arch.

In walls: find contents of arch by same rule and add to wall measurement.

In sewers and tunnel arches, multiply length of extrados by thickness of arch.

FLOOR ARCHES AND BRICK PAVING.

Floor arches and brick paving to be measured by the superficial foot and by rule given for measuring concrete. Deduct well-holes.

BRICK-NOGGING.

Measure as ordinary brickwork. Deduct full openings—no studding.

CUTTING.

Cutting of joists or other poles by the piece; of slots, panels and recesses by the lineal foot.

TOOTHING.

When ordered by the owner or his superintendent to tooth, rack or block, in consequence of delay of iron, stone or other material, that masonwork may connect with, such toothing, racking or blocking shall be measured as extra work, as follows: Increase girt length of such line by one-half, and multiply by one foot of thickness of wall.

PRESSED BRICKWORK.

Measure all exposed surfaces of brick by the superficial foot.

CUT-STONE SETTING.

Measure vault covers, flagging, curbing and ashlar by the superficial foot, coping and belt courses by the lineal foot; all other cut stone by the cubic foot.

TUCKPOINTING AND CLEARING.

Tuckpointing and cleaning and pointing stonework to be measured by the superficial foot of exposed surfaces.

DEAFENING.

Deafening to be measured by the superficial yard, floor measure, between walls—take out well-holes.

STANDARD RULES OF THE MEASUREMENT OF PLASTERING

ADOPTED BY THE

EMPLOYING PLASTERERS' ASSOCIATION OF CHICAGO.

LATH AND PLASTERING

to be measured by the superficial yard, from floor to ceiling for walls, and from wall to wall for ceiling.

In rooms containing one or more horizontal angles between the floor and ceiling line, the ceiling to be measured from wall to wall, as though all walls were vertical, for contents of ceiling, and from floor to highest point of ceiling for height of wall.

OPENINGS.

Openings in plastering to be measured between grounds. No deductions to be made for openings of two feet or less in width. One-half of contents to be deducted for openings two feet or more in width. The contents of all store front openings to be deducted, and the contractor to be allowed one foot six inches for each jamb by the height.

All beams or girders projecting below ceiling line to have one foot in width by total length added for each internal and external angle.

CORNER BEADS, ARCHES, ETC.

All corner angles of more or less than 90 degrees, beads, quirks, rule joints and moldings, to be measured by the lineal foot on their longest extension; add one foot for each stop or miter.

CORNICES.

Length of cornices to be measured on walls. Plain cornices of two feet girt or less to be measured on walls by the lineal foot. Plain cornices exceeding two feet girt to be measured by the superficial foot. Add one lineal foot by girt for each stop or miter. Enriched cornices (cast work), by the lineal foot for each enrichment.

Arches, corbels, brackets, rings, center pieces, pilasters, columns, capitals, bases, rosettes, bosses, pendants and niches, by the piece. Ceiling or frieze plates over eight inches wide, by the square foot.

COLUMNS.

All columns to be measured by the lineal foot.

CEMENT WAINSCOTING.

All cement wainscot to be measured by the square foot, openings to be allowed as for plain plaster.

GROUNDS.

All grounds for various classes of work to be as follows, unless expressly specified to the contrary:

Grounds for 2-coat lath work	¾ inch
Grounds for 3-coat lath work	⅞ inch
Grounds for 3-coat metal lath work	¾ inch
Grounds for 3-coat metal lath work, on ½-inch iron furring	1 inch
Grounds for 3-coat metal lath work, on 1-inch iron furring	1½ inch
Grounds for hard mortar lath work	⅝ inch
Grounds for hard mortar metal lath work	½ inch
Grounds for hard mortar metal lath work, on ½-inch iron furring	⅞ inch
Grounds for 2-coat work on brick or tile	½ inch
Grounds for hard mortar on brick or tile	½ inch

Where metal lath is spoken of it applies to all wire or metal lath.

BUILDING ORDINANCE.

PASSED MARCH 28, 1898. With amendments to July 1, 1901.

All amendments and revisions will be found at the end of the original ordinance. See page 105.

Be it ordained by the City Council of the City of Chicago:

Section 1. **Building Department Established.**—There is hereby established an executive department of the municipal government of the City of Chicago, which shall be known as the Department of Buildings, and shall embrace a Commissioner of Buildings, a Deputy Commissioner of Buildings, a Secretary to the Commissioner, also such Inspectors of Elevators, Inspectors of Stand Pipes and Fire Escapes, and Inspectors of Buildings, and such other assistants and employes as the City Council may, by ordinance, prescribe and establish.

Sec. 2. **Commissioner — Appointment — Term — Duties.**— There is hereby created the office of Commissioner of Buildings, who shall be the head of said Department of Buildings, and shall be an experienced architect, civil engineer or builder, and who shall not be engaged in any other business while acting as Commissioner of Buildings.

He shall hold his office for the term of two years, and until his successor shall be appointed and qualified. He shall be appointed by the Mayor, by and with the advice and consent of the City Council, on the first Monday in May, 1898, or as soon thereafter as may be.

Sec. 3. **Commissioner's Bond.**— Said Commissioner, before entering upon the duties of his office, shall execute a bond to the City of Chicago in the sum of twenty-five thousand ($25,000) dollars, with such sureties as the City Council shall approve, conditioned for the faithful performance of the duties of his office.

Sec. 4. **Appointment of Subordinates.— Bonds of Subordinates.**— He shall have the management and control of all matters and things pertaining to the Department of Buildings, and shall appoint, by and with the consent of the Mayor, all subordinate officers and assistants named in the first section of this ordinance, and may remove them for inefficiency or neglect of duty. All subordinate officers, assistants, clerks and employes in said department shall be subject to such rules and regulations as shall be prescribed from time to time by said Commissioner.

Said Commissioner shall require good and sufficient bonds to be given by all subordinate officers and employes in said department who shall receive, or have the care, custody or handling of any money belonging to the City of Chicago, and said bonds shall be approved by the Mayor and Comptroller.

Sec. 5. **Enforcement of Ordinances.** It shall be the duty of said Commissioner to enforce all ordinances relating to the erection, construction, alteration, repair, removal or the safety of buildings.

Sec. 6. **Precautions in Behalf of Public Safety.—May Require Repair or Alteration in Such Cases.**— It shall be the duty of the Commissioner of Buildings, when any citizen representing that ashes or combustible materials are kept in any place in the city in an insecure manner, or that the doors or stairways in any factory or workshop or other place of employment are insufficient for the escape of employes in case of fire, panic or accident; or that the funnels, flues, fire boxes or heating apparatus in any building in the city are insecure or dangerous, or that any part of any building in the City of Chicago is in an unsafe or dangerous condition, or in any wise in contravention of this ordinance, to make an examination of such place or building, and if such representation is found to be true said Commissioner shall give notice in writing to the owner or lessee of such place or building to make such changes, alterations or repairs as public safety or the ordinances of the City of Chicago may require; and it shall be unlawful to continue the use of such building until the changes, alterations or repairs found necessary by the Commissioner of Buildings to make said building or part thereof safe or to bring it into compliance with this ordinance, shall have been made.

Sec. 7. **Inspection of all Buildings in General Use.—Must Report all Unsafe Conditions.**—The Commissioner of Buildings shall inspect or cause to be inspected all public school buildings, public halls, churches, theaters and all buildings used either for manufacturing or commercial purposes, also all hotels, apartment houses and other buildings

occupied by large numbers of people, for the purpose of determining the safety of such buildings, or any parts or appliances or equipment thereof, sufficiency of their doors, passageways, aisles and stairways, and generally their facilities for egress in case of fire or other accident; the strength of their floors, their safeguards connected with the storage of combustibles, their appliances for extinguishing fires and for resisting the spread of fire, and shall make returns of all violations of the several provisions of this ordinance to the Law Department for prosecution.

Sec. 8. **Must Keep Record of Private Property Taken for Public Use.—Issue of Permits for Such Property Guarded Against.**—Hereafter, upon the passage of an ordinance providing for the taking of any private property for public use, the Commissioner of Public Works shall, at once, cause a plat of the property proposed to be taken to be made and file the same in the office of the Commissioner of Buildings. The Commissioner of Buildings is hereby instructed not to issue any permit for the erection or improvement of any building or buildings in or upon any of the property proposed to be taken by any ordinance as aforesaid, until such ordinance shall have been repealed.

Sec. 9. **Interpretation of this Ordinance.**—The Commissioner of Buildings shall have full power to pass upon any question arising under the provisions of this ordinance relating to the manner of construction, subject to the conditions, modifications and limitations contained in this ordinance.

Sec. 10. **Inspection of Elevators.—Power to Stop Use of Same.**—The Commissioner of Buildings shall have power to prohibit and stop the use of any passenger or freight elevator when the Inspector of Elevators shall report to him that the elevator or the hoistway in which it is used is in a dangerous or unsafe condition. And such prohibition of use shall continue in force until such hoistway or elevator, or both, shall have been put in safe condition, and certified to be safe after a proper inspection thereof by the Inspector of Elevators.

Sec. 11. **May Order Precautions Taken in Unsafe Buildings.—May Direct Fire Department to Remove.**—The Commissioner of Buildings shall have authority, if he finds any building or part thereof in such condition as to endanger life, and so that such danger may be averted by the immediate application of precautionary measures, to cause such precautionary measures to be taken, and all work necessary to render said building or any part thereof safe to be done, after having served written notice upon the owner, lessee, occupant or agent of said building personally.

The Commissioner of Buildings shall also have authority to direct the Fire Department, after written notice has been served upon the owner, lessee, occupant or agent personally, to tear down any defective or dangerous wall, or any building, or any part thereof, which may be constructed in violation of the terms of this ordinance. And in case of the destruction, or partial destruction, of buildings by fire, or by the action of the elements, when any department of the City Government, pursuant to the ordinances of the city and the duty of the city in the premises, shall make any outlay of money or incur any liability for the payment of any expense on behalf of the city in an effort to preserve or prevent the destruction of any such building or buildings, or for the preservation of the life or health of its citizens, it shall be the duty of the Commissioner of Buildings to ascertain the amount of such outlay or expenditure and present a bill therefor to the owner or owners of any such building or buildings, or his or their agent or agents, and it shall be the duty of the said Commissioner of Buildings to refuse to issue a permit for the reconstruction, alteration or repair of any such building or buildings by such owner or owners, or his or their grantees until such outlay or expenditure shall be repaid to the city by the owner or owners of said building or buildings (or his or their grantees), so totally or partially destroyed in the manner aforesaid.

Sec. 12. **May Make Rules for Construction of Buildings.**—The Commissioner of Buildings shall institute such measures and prescribe such rules and regulations as shall secure the careful erection and inspection of all buildings while in process of construction, alteration, repair or removal, and the strict enforcement of the several provisions of this ordinance.

Sec. 13. **May Stop Construction When in Violation of Ordinance.—Must Sign All Certificates and Notices.**—Said Commissioner shall have power to stop the construction of any building or the making of any alterations or repairs of any building within said city when the same is being done in a reckless or careless manner, or in violation of any ordinance of said city, and to order in writing, or by parole, any and all persons in any way or manner whatever engaged in so constructing, altering or repairing any such building to stop and desist therefrom.

The Commissioner of Buildings shall sign all certificates and notices required to be issued from said department, and keep a record of the same, and issue all permits and collect all fees authorized herein to be collected by said department.

Sec. 14. **Must Keep a Register.**—Said Commissioner of Buildings shall keep in proper books for that purpose a register of all transactions of the Department of Buildings, which said books shall be open to the inspection of the Mayor, Comptroller, Superintendent of Police, Fire Marshal and members of the City Council, at all times.

Sec. 15. **Must Keep Account of Fees Paid.**—Said Commissioner shall keep, in proper books for that purpose, an accurate account of all fees paid, giving the name of the party, date and amount of such fee or fees.

Sec. 16. **Must Render Report Monthly.**—The Commissioner of Buildings shall on the first day of each month render a report, under oath, to the City Comptroller of the number of building permits issued, with the amounts collected for the same, number of elevator certificates issued, with the amounts collected for the same, and with said reports shall file a duplicate receipt from the City Collector of moneys thus collected.

Sec. 17. **Must Make Annual Reports to City Council with Estimates.**—The Commissioner of Buildings shall annually, on or before the first day of February, in each year, prepare and present to the City Council a report showing the receipts and expenditures and entire work of his department during the previous fiscal year, and he shall at the same time send to the Comptroller a full and comprehensive statement of all matters pertaining to his department, together with an estimate in detail of the appropriations required by the department during the next municipal year.

Sec. 18. **Salary.**—The salary of the Commissioner of Buildings shall be $5,000 per year.

Sec. 19. **Deputy Commissioner — Qualifications — Duties.**—The Deputy Commissioner of Buildings to be designated by the Commissioner shall be a competent civil engineer, architect or builder, who has had at least ten (10) years' experience in architectural work. He shall pass upon all questions relating to the strength and stability of buildings, and act as Commissioner of Buildings in case of the absence of the Commissioner from his office, and while so acting shall discharge all the duties and possess all the powers invested in or imposed upon the Commissioner of Buildings.

Sec. 20. **Salary.**—The salary of the Deputy Commissioner of Buildings shall be $4,000 per annum.

Sec. 21. **Secretary—Duties of.**—The Commissioner of Buildings shall appoint a Secretary, whose duty it shall be to preserve and keep all books, records and papers belonging to said office, or which are required by law to be filed therein. The Secretary shall deliver to the City Council and to the respective departments all communications from said Commissioner in writing, and shall attend to the office of said department during the usual business hours, and do and perform such of the services as may be required by said Commissioner.

Sec. 22. **Inspectors — Qualifications — Examination of.**—The Inspectors of Buildings shall be competent men, either architects, civil engineers, masons, iron workers or carpenters, bricklayers or stonecutters, who have served at least five (5) years as such, not including the term of apprenticeship. They shall be men of good character, able to make out with clearness written reports, and no person shall be appointed as Inspector of Buildings who is deficient in these qualifications. Before their appointment to office they shall pass an examination as to their ability and fitness before a committee of five examiners to be appointed by the Civil Service Commission. A majority of said examiners shall sign a certificate as to the applicant's competency to perform all the duties of the office, and, if appointed, he shall not be engaged in other business or vocation but that of Inspector of Buildings.

Sec. 23. **Inspectors—Their Duties—Reports—How Made.**—The said inspectors shall, under the direction of the Commissioner of Buildings, examine all buildings in the course of erection, alteration, repair or removal throughout the city, at least once a week, or as often as required for securing efficient supervision, and shall make written reports to said Commissioner as to all violations of any ordinance or ordinances of the city which the Department of Buildings is required to enforce, together with the street and number where such violations are found, the names of the owner, agent, lessee, occupants, architect, contractors, and master mechanics, and all other matters relative thereto as far as they can ascertain them.

Sec. 24. **Must File Daily Report.**—The Inspectors of Buildings must file daily reports of their work of inspection, which shall be entered in books to be kept for this purpose, and which shall be open to official inspection at all times.

Sec. 25. **Record of Inspection—How Made.**—The said inspectors shall examine all buildings and walls reported dangerous or damaged by fire or accident, and make a record of such examinations, with the name of the street and number of the building, and of the names of the owners, agents, lessees and occupants thereof.

Sec. 26. **Inspection of Alteration, Enlargement or Raising.**—The Inspectors of Buildings shall examine all buildings for which an application to raise, enlarge or alter has been made, and shall make a written report upon the condition of the same to the Commissioner of Buildings.

Sec. 27. **Other Duties.**—Said inspectors shall perform such other duties as may be required of them by said Commissioner of Buildings, the rules and regulations of the Department of Buildings, or the ordinances of the city.

Sec. 28. **Elevator Inspectors — Qualifications — Examinations.**—The Inspectors of Elevators shall be experienced mechanical engineers, builders or mechanics, and shall

before appointment pass examination the same as the Building Inspectors, and shall not be employed or engaged in any other business or vocation.

Sec. 29. **Elevator Inspections—How Made—Record of.**—They shall, as often as once in six months carefully examine and inspect each hoistway in which an elevator is used or operated, and the doors and shafts in connection therewith; and also examine and inspect all passenger and freight elevators, cars or plaforms used and operated in any building in the City of Chicago, and report in writing to the Commissioner of Buildings the condition of each hoistway and elevator, and shall enter such reports in books kept for this purpose and open to official inspection.

Sec. 30. **Inspector—Fees.**—The owners, agents or occupants of all buildings in which elevators are used shall pay the Commissioner of Buildings, before a certificate of inspection is issued to him, a fee of two ($2) dollars for each inspection of each elevator made in pursuance of this ordinance.

Sec. 31. **Certificates of Inspection—Details of.**—When an inspector finds a hoistway, door, shaft and elevator in a perfectly safe condition, he shall make and deliver to the owner, or to his or her agents, a certificate signed by the Commissioner, which shall contain the date of inspection, the condition of the elevator at that date, the weight it may safely carry, and that the shaft and doors are constructed in a safe and proper manner, or are constructed in accordance with this ordinance, which certificate shall be by the owner of the elevator framed and put up in some conspicuous place in such elevator, for examination by the public; *provided*, that the words "safe condition" in this section shall mean that it is safe for any load up to its original safe capacity.

Sec. 32. **Other Duties.**—The Inspector of Elevators shall perform such other duties as may be required of him by the Commissioner of Buildings, the rules and regulations of the Department of Buildings, or the ordinances of the city.

Sec. 33. **Entrance to Buildings.**—The Commissioner and Deputy Commissioner of Buildings, as well as the Inspectors of Buildings and of Elevators, are empowered to enter any building, whether completed or in process of erection, for the purpose of determining whether the same has been or is being constructed in accordance with the terms of this ordinance, and it shall not be lawful to exclude them from such building.

Sec. 34. **Appeal from Decision.—Arbitration.—Limit of Time of Appeal.—Cost of Appeal.—Arbitrators to Take Oath.—Power to Examine Witnesses.—In Urgent Cases Commissioner's Power Final.—Emergency Board of Arbitration.** In cases where discretionary power to estimate damage to frame buildings is given the Commissioner of Buildings, as also in questions relating to the security or insecurity of buildings or parts thereof, and in all other cases where discretionary powers are, by these ordinances, given to the Commissioner of Buildings, an appeal to arbitration shall be allowed to parties believing themselves injured or wronged, by the decisions of the Commissioner of Buildings, as follows, to-wit:

The persons wishing to make such appeal shall do so within five days after written notice of the decision or order of the Commissioner of Buildings has been given them. An appeal made later than five days after serving notice of the Commissioner of Buildings shall not entitle the appellant to an arbitration. The request for arbitration shall be in writing, and shall state the object of the proposed arbitration and the name of the person who is to represent the appellant as arbitrator. The Commissioner of Buildings shall thereupon state to the appellant the cost of such arbitration, and such appellant shall, within twenty-four hours from the time of filing the original request for arbitration, deposit with the Commissioner of Buildings the sum of money required for defraying the expenses of the same, which sum shall in each case be fixed by said Commissioner in proportion to the difficulty and importance of the case, but shall in no case be more than the cost of similar service in the course of ordinary business of private individuals or corporations. As soon as such sum of money shall have been deposited with him, the Commissioner of Buildings shall appoint an arbitrator to represent the city, and the two arbitrators thus appointed shall, if they cannot agree, select a third arbitrator, and these arbitrators shall, after investigating the matter in question, make a decision with regard to the same, which shall be final and binding upon the appellant as well as upon the city. The arbitrators shall themselves, before entering upon the discharge of their duties, be placed under oath to the effect that they are unprejudiced as to the matter in question, and that they will faithfully discharge the duties of their position. They shall have the power to call witnesses and place them under oath, and their decision or award shall be rendered in writing both to the Commissioner of Buildings and to the appellant from his decision. The fee deposited by the appellant with the Commissioner of Buildings shall be paid by the Commissioner of Buildings to the arbitrators upon the rendering of their report, and shall be in full of all costs incident to the arbitration; but should the decision of said Board of Arbitration be rendered against the Commissioner of buildings, then the money deposited by the aforesaid appellant shall be returned to him, and the entire costs of said arbitration shall be paid by the City of Chicago.

Whenever the Decision of the Commissioner of Buildings upon the safety of any building or any part thereof is made in a case so urgent that failure to promptly carry out

his orders to demolish or strengthen such building or part thereof may endanger life and limb, the decision and order of the Commissioner of Buildings shall be absolute and final.

Provided, If in the opinion of the Commissioner of Buildings it becomes necessary to demolish any building, or part thereof, said Commissioner of Buildings shall call to his aid the President of the Illinois Chapter of the American Institute of Architects and the President of the Builders' and Traders' Exchange of Chicago, or their appointees, who, with the Commissioner of Buildings, shall form a Board of Arbitration, and the decision of a majority of said Board shall be absolute and final. Said Board of Arbitration shall serve without pay, and must report within forty-eight hours after their appointment; but it is expressly understood that said Board of Arbitration shall not have any authority or power in cases of walls or buildings destroyed by fire, explosion or similar causes, and that the decision of the Commissioner of Buildings in such cases shall be absolute and final.

Sec. 35. **Permits—When Required.— Limitation of Time for Permits.**— Before proceeding with the erection, enlargement, alteration, repair or removal of any building in the City of Chicago, a permit for such erection, enlargement, alteration, repair or removal shall first be obtained by the owner or his agent from the Commissioner of Buildings, and it shall be unlawful to proceed with the erection, enlargement, alteration, repair or removal of buildings, or of any structural part thereof, or of any structure which is to be used for the support, shelter or enclosure of persons, animals or chattels within the City of Chicago, unless such permit shall first have been obtained from the Commissioner of Buildings.

If, after a permit for the erection, enlargement, alteration, repair or removal of a building shall have been granted, the operation called for by the said permit shall not be begun within six months of the date thereof, or if such operations are not completed within the time fixed in said permit for the duration thereof, then said permit shall be void, and before such operations can be begun or completed, a new permit shall be taken out by the owner or his agent, and fees as herein fixed for the original permit shall be paid therefor.

Sec. 36. **Application for Permits - How Made—How Recorded.- Stamped Plans - How Cared for.—Return of Same.**—Applications for such permits shall be made in writing by the owner or his agent, and when such application and plans and specifications conform to this ordinance, the Commissioner of Buildings shall issue a permit, and shall file said application, and shall apply to such plans and specifications an official stamp, stating that the drawings and specifications, to which the same have been applied, comply with the terms of this ordinance. The plans and specifications so stamped shall then be returned to such applicant. True copies of so much of said plans and specifications as may be required in the opinion of the Commissioner of Buildings to illustrate the features of construction and equipment of the building referred to in this ordinance shall be filed with the Commissioner of Buildings, and shall remain on file in his office until the completion or occupation of said building, after which such drawings and specifications shall be returned by the Commissioner of Buildings to the parties by whom they have been deposited with him, upon the demand of said person or persons. It shall not be obligatory upon the Commissioner of Buildings to retain such drawings in his custody for more than three months after the completion or occupation of any building.

And all such plans and drawings shall be drawn to a scale of not less than one eighth (⅛) of an inch to the foot, on paper or cloth, in ink, or by some process that will not fade nor obliterate. All distances and dimensions must be accurately figured, and drawings made explicit and complete, showing the entire sewerage and drain pipes and location of all plumbing fixtures within such building. Each set of plans presented for permit must be accompanied by a set of specifications describing all materials to be used in the proposed building, and both the plans and specifications must be approved by the Commissioner of Buildings before a permit will be granted. No permit shall be granted or plans approved unless such plans shall be signed and sealed by a licensed architect, as provided in "An act to provide for the licensing of architects and regulating the practice of architecture as a profession in the State of Illinois," approved June 3d, 1897. Provided, that permits may be granted for the erection of buildings of Class III, as hereinafter defined, provided such buildings shall not be more than two stories in height and shall have a superficial area of not more than 1,250 square feet, outside dimensions, on plans approved by the Commissioner of Buildings, which plans need not be signed by a licensed architect; provided, that all architects and applicants for such permits shall obtain from the City of Chicago a license, as provided for in Section 219 of this ordinance.

Sec. 37. **Alterations Upon Stamped Plans Not Permitted Without Permission.**—It shall be unlawful to erase, alter or modify any lines, figures or coloring contained upon such drawings or specifications so stamped by the Commissioner of Buildings, or filed with him for reference. If, during the progress of the execution of such work, it is desired to deviate in any manner affecting the construction of other essential of the building from the terms of the application, drawing or specification, notice of such intention to alter or deviate shall be given in writing to the Commissioner of Buildings, and his written assent must first be obtained before such alteration or deviation may be made.

Alterations in buildings which do not involve any change in their structural parts or of their stairways, elevators, fire escapes or other means of communication or ingress or egress may be made without the permission of the Commissioner of Buildings.

Sec. 38. **Deposit with Water Department—How Made—Indemnifying Bond.**—Before the Commissioner of Buildings issues a permit as aforesaid, he shall first satisfy himself that the applicant for such permit has made payment to the Bureau of Water of the City of Chicago for the water to be used in such building, or for water meter for measuring all the water used in the construction of such building under the regulations of the Bureau of Water. He shall also, before issuing such permit, satisfy himself that the applicant for the same has filed with and approved by the Commissioner of Public Works of the city an indemnifying bond protecting the city as against any and all damage that may arise to the streets or alleys upon which such building is situated, and to the City of Chicago, and to life and limb of passers-by, in consequence of the proposed operations to be covered by said permit.

Sec. 39. **Fees for Water Used.— Fees for Street Obstructions.**—The fees to be paid in connection with permits for the erection of buildings, shall be as follows, to-wit:

For the water to be used in connection therewith at the rate of five cents for every 1,000 bricks, wall measure, used in the construction of a building; also,

At the rate of six cents for every 100 cubic feet of rubble stone used in connection therewith; also,

At the rate of eight cents for every 100 cubic feet of concrete used in connection therewith; also,

At the rate of fifteen cents for every 100 yards of plastering used in connection therewith; and,

At the rate of five cents for every 100 cubic feet for hollow tile arch, partition or fireproof covering used in any building.

Permits for the obstruction of streets shall be issued by the Commissioner of Public Works and shall be paid for, in proportion to the street frontage occupied, at the rate of two dollars per month for each twenty-five feet of frontage so occupied.

Provided, that before any permit is issued by the Commissioner of Public Works to any person, firm or corporation engaged in the roofing business, for leave to use the public streets for delivery of material or as a temporary storage place for such roofing material, such person, firm or corporation shall file with the Commissioner of Public Works a bond to the City of Chicago in the sum of five thousand ($5,000) dollars, to be approved by said Commissioner of Public Works, conditioned to save the City of Chicago harmless from all damages on account of such user, and shall also deposit for each job or building, if the Commissioner of Public Works shall so require, the sum of fifty ($50) dollars with the said Commissioner of Public Works for the purpose of securing the immediate repair and clearing of any portion of the public streets encumbered by such material, and for this purpose not less than the sum of two ($2) per month in advance, during the furnishing of such roofing material, shall be charged against said deposit for the use of the City of Chicago for the purpose aforesaid of clearing the public streets of such material as may be accidentally or otherwise scattered thereon during the furnishing of such roofing material in the case of each building or appurtenance upon which roofing is being done by such person, firm or corporation, and the balance of such deposit in each instance will be surrendered to such person, firm or corporation at any time upon the surrender of the permit for the use of the public streets for the particular job in which the permit was issued and the said deposit made and the surrender of the receipt therefor.

Sec. 40. **Permits—Cost of.**—The price for building permits proper shall be as follows:

For sheds not exceeding 256 square feet in area, $1.

For open shelter sheds at the rate of fifty cents for each 1,000 cubic feet or part thereof.

For buildings one story in height and not exceeding 25 by 40 feet in area, $1.50.

For buildings more than one story in height or larger in area than 25 by 40 feet, the fee for the permit shall be at the rate of ten cents for every 1,000 cubic feet or fractional part thereof contained in said structure, the cubic contents being measured to include every part of the building from the basement floor to the highest point of roof, and all bay windows and other projections.

Sec. 41. **Occupation of Sidewalk and Street—Limitations.**—The extent of occupation of sidewalk and street to be covered by the terms of a permit for street obstruction or building, shall be as follows:

Such permit shall not authorize the occupation of any sidewalk or street or part thereof other than that immediately in front of the premises of the building upon which said permit is issued.

During the progress of building operations, at least one-third of the sidewalk in front of the premises of the building for which such permit is granted, shall be at all times kept free and unobstructed for the purposes of passage, and clear of rubbish, dirt and snow. Such sidewalks must, if there are excavations on either side of the same, be pro-

tected by substantial railings which shall be built and maintained thereon so long as such excavations continue to exist. It is not intended hereby to prohibit the maintenance of a driveway for the delivery of material across such sidewalk from the curb line to the building site.

Sec. 42. **Delivery of Material—Elevated Sidewalks.—Temporary Roof Over Sidewalk—Time Maintained.– Storage of Building Materials.—Limitations—Excavated Material and Rubbish—How Cared for.**– It shall be permitted, for the purpose of delivering material to the basements of the buildings, to elevate such temporary sidewalks to a height of not exceeding four feet above the curb level of the street; and in case a sidewalk is so elevated, it shall be provided with good substantial steps on both ends of the same, and shall have railings, as before specified, on both sides thereof.

If the building to be erected is more than four stories in height, and is set at or near the street line, there shall be built over such sidewalk a roof having a framework and covering, composed of supports and stringers of 3 by 12 timbers, not more than four feet from centers, covered by two layers of 2-inch plank.

Said roof shall be maintained as long as material is being used or handled on said street front and above the level of such sidewalk.

In all cases, such temporary sidewalks and their railings and approaches, and the roofs over the same, shall be made, as regards ease of approach, strength and safety, to the satisfaction of the Commissioner of Buildings.

The occupation of the street for the storage of building materials shall never exceed, in front of any one building, one-quarter of the width of the roadway of the same, and in streets containing railroad tracks, such occupation shall not exceed one-half the distance from the curb stone to such railroad track.

Earth taken from excavations, and rubbish taken from buildings, must not be stored either upon sidewalks or roadways of streets, and must be removed from day to day as rapidly as produced. When dry rubbish, apt to produce dust, is being handled, it must be kept wetted down, so as to prevent its being blown about by the wind.

Sec. 43. **Derricks—Limitation.**—For all buildings more than four stories in height, the use of derricks set upon the sidewalk is prohibited. Materials for such buildings shall be hoisted entirely within the enclosing walls of the same. On no condition shall derrick posts be allowed put on the public street, and in no case shall the guy lines be less than 15 feet above the roadbed.

Sec. 44. **Adjacent Frontage—How Occupied for Building Purposes.**—It is provided that if the written consent and a waiver of claims for damages against the City of Chicago of the owners of properties abutting upon the site of any proposed building is first obtained and filed with the Commissioner of Public Works, the permission to occupy the roadway and the sidewalk may be extended beyond the limits of such building upon the same terms and conditions as those herein fixed for the occupation of sidewalk and street in front of the building sites themselves.

Sec. 45. **Use of Street for Building Purposes—When Terminated.**— The permission to occupy streets and sidewalks for the purposes of building is intended only for use in connection with the actual erection, repair, alteration or removal of buildings, and must terminate with the completion of such operation. It shall be unlawful to occupy any sidwalk or street after the completion of the operation for which a permit has been issued by the Department of Buildings. It shall also be unlawful to occupy a sidewalk or street, under authority of such permit, for the storage of articles not intended for immediate use in connection with the operations for which such permit has been issued.

Sec. 46. **Red Lights.**—Red lanterns shall be displayed and maintained during the whole of every night at each end of every pile of material in any street or alley and at each end of every excavation.

Sec. 47. **Hospitals - Stables—Special Consents Necessary.**—Before granting permits for the construction or alteration or enlargement of hospitals or of livery, sale or boarding stables, the Commissioner of Buildings shall take notes of the following provisions of this ordinance relating to such buildings:

Sec. 48. **Hospitals—Permits—Special Consents.**– It shall be unlawful to erect, establish, build, construct or maintain any hospital for the treatment and nursing of any person or persons, affected with any disease whatever, on any residence street or avenue in the City of Chicago, until there be first obtained the written consent of the person or persons who may be the owners or agents of the entire frontage of the four sides of the block in which such building is to be located, and the entire frontage of the block on the opposite side of the street on which such building faces. Such written consent, as is herein provided, shall be filed with the Commissioner of Buildings before any permit shall be granted for the construction or erection of any building for such hospital.

Sec. 49. **Stable Permits—Special Consents.**—It shall not be lawful for any person to locate, build, construct or keep on any street in any block in which one-third of the buildings are devoted to exclusive residence purposes, a livery, boarding or sale stable, gas house, gas reservoir or other building for any business purpose, unless the written con-

sent of the property owners or agents on both sides of the street in such block shall be first obtained and filed with the Commissioner of Buildings before a permit be granted for the construction or keeping of such buildings.

Sec. 50. **Permits for Raising or Altering Buildings—Requirements.**—Permits to alter or raise wooden buildings shall be given, provided they do not involve an enlargement or raising of such buildings beyond the limits of dimensions herein prescribed for frame buildings, and if the strains upon material thereof are kept within the maximum strains herein fixed for the same: and if, further, said frame building has not been damaged to any extent greater than 50 per cent. of its original value by fire, wear and tear, the action of the elements or otherwise.

Sec. 51. **Permits for Moving Buildings—Requirements.—Written Consents Must be Obtained.—Affidavits Made.**—Permits to move buildings shall be granted in accordance with the following. If said frame building has not been damaged to an extent greater than 50 per cent. of its original value by fire, wear and tear, the action of the elements or otherwise. Any person desiring to remove a wooden building shall first obtain the written assent to such removal from persons owning a majority of feet front of lots in the same block in which it is proposed to locate such removed building, and also a majority of persons owning front feet opposite the proposed location and within 150 feet of the same. And such person shall also file an affidavit subscribed and sworn to by one or more persons in the following form, as near as may be, viz:

CITY OF CHICAGO,
County of Cook, State of Illinois, } SS.

And.....each being duly sworn on oath, deposes and says, each for himself, that he was present and saw the persons whose names are subscribed to the above petition, sign the same, and that each and every one of said parties claimed at the time of said signature that they were the owners of the property placed opposite their respective names in the following petition, or the attorneys or agents of the owners, with full authority to sign and act for them. Subscribed and sworn to before me this.....day of....., A. D. 18....

This section shall not apply to the case of any person removing a building upon his own premises and not going upon the premises of any other person, or upon any street, alley or other public place, in making such removal.

Sec. 52. **House Mover's License and Bond.—Fee for House Moving—Requirements.**—No person, except a licensed house mover, shall remove any building within the limits of the city; and every such person shall annually, before engaging in said occupation, obtain a license therefor from the Commissioner of Public Works, and no such license shall be granted until the party applying therefor shall have given a bond in the sum of $5,000, with good and sufficient sureties, to be approved by the Commissioner of Public Works, conditional, among other things, that said party will pay any and all damages which may happen to any pavement, street or sidewalk, or to any telegraph pole or wire belonging to the City of Chicago, or to any tree or trees, whether said damage or injury shall be inflicted by said party or his agents, employes or workmen; and conditional, also, that said party will save and indemnify and keep harmless the City of Chicago against all liabilities, judgments, costs and expenses, which may in any wise accrue against said city in consequence of the granting of such permit or license, and will in all things strictly comply with the conditions of his permit.

Upon the execution of said bond and its acceptance of said Commissioner of Public Works, a license shall be issued, and the said licensed person shall in each and every instance, before removing any building, obtain a permit to do so from the Commissioner of Public Works, and shall pay to said Commissioner a fee of $5, whereupon said Commissioner shall issue a permit, stating specifically all the conditions, describing the route to be taken, and limiting the time for removal.

The fee for a permit to remove a building from one part of a lot to another part of the same lot, or from one lot to another, when the same is owned by the same persons, and where said building or buildings are to be removed without crossing any street or alley, or the property of any person or persons, other than the owner of the lot from which the building is to be removed, shall be $1.

Sec. 53. **Violation of Building Ordinance—Revocation of Permit—Requirements for Reissue.**—If work upon any building shall be conducted in violation of any of the provisions of this ordinance, either as to occupation of sidewalk or street, or the use or application of material or workmanship, it shall be the duty of the Commissioner of Buildings to revoke the permit for the building operations in connection with which such violation shall have taken place. And it shall be unlawful, after the revocation of such permit, to proceed with such building operations, unless such permit shall first have been reinstated or reissued by the Commissioner of Buildings. Before a permit, revoked for the cause or causes before mentioned, can be lawfully reissued or reinstated, the entire building and building site must be first put into condition corresponding with the terms of this ordinance, and any work or material applied to the same in violation of the terms of this ordinance shall be first removed from said building.

Sec. 54. **Fire Limits.**—The fire limits of the City of Chicago shall be as designated in Section 214 of this ordinance. The provisions of this ordinance as to the strength and stability of timber constructions shall also apply to the construction of frame buildings outside of the fire limits.

Sec. 55. **Frame Buildings Outside Fire Limits.**—Outside of said fire limits it shall be lawful to erect frame buildings not exceeding forty (40) feet in height from the sidewalk to the highest point of roof. If such frame buildings have a basement story of brick their height above the sidewalk may be made 45 feet.

Sec 56. **Raising Frame Buildings — Requirements.— Changing Hip Roofs to Flat Roofs.**—Permission may be granted by the Commissioner of Buildings for the raising of existing frame buildings, whether within or without the fire limits, to the limits of height hereinbefore fixed for new frame buildings, and no more. The Commissioner of Buildings is also authorized to issue permits for changing gable or hip roofs of existing frame buildings to flat roofs, and for the raising of walls incident to such change. But if such hip or gable roof is changed to flat roof and the walls raised in connection with such change, the total cubic contents included by the walls so raised and the roofs so altered shall not exceed the cubic contents originally included in such gable or hip roofs.

Sec. 57. **Repairing Damaged Buildings - Limitations.**—It shall not be lawful to repair or reconstruct or remove any frame building which has been injured more than 50 per cent. of its original value by wear and tear, by the effects of the elements, or by fire, nor to occupy for human habitation any building which is declared by the Commissioner of Health to be unfit for such habitation by reason of defective sanitary conditions, until such conditions have been remedied and the premises approved by said Commissioner of Health as fit for occupancy.

Sec. 58. **Frame Buildings—Requirements as to Lot Lines--Number—Dimensions.**— Frame buildings shall not be built nearer than one foot to any line of the lot upon which they are built, street and alley lines excepted. It shall not be lawful to erect a frame building wider than forty feet nor deeper than seventy feet. If more than one frame building is built in the direction of the depth of any one lot, such buildings shall not be built with a less distance than ten feet between them.

Sec. 59. **Chimneys in Frame Buildings - Chimney Flues Through Partitions.** - Chimneys in frame buildings shall be built of brick, or if built of hollow tile there shall be a double tile wall around the smoke duct; they shall have socket joints. All joints, whether in tile or in brick chimneys, shall be well filled with mortar and neatly pointed on the outside. Brick chimneys to have flue linings of fire clay on the inside. The wood framing of frame buildings shall be trimmed around chimneys in such manner as not to come within two inches of the same.

Metal smoke pipes or tile flues of single thickness shall not extend through the floors or through the ceiling or roof of any building; and where such smoke pipes or tile flues pass through partitions the woodwork of such partitions shall be protected either by a course of brick built all around such smoke pipes or tile flues, or by a thimble made of bright tin, the two rings thereof being at least three inches apart, with proper ventilating holes provided in the outer covering of the same on both sides of the partitions.

Sec. 60. **Frame Buildings Carried to Uniform Height.** - Frame buildings, the different parts of which are of different heights, may be carried up to a uniform height, provided the aggregate height thereof does not exceed the limits of height prescribed for frame buildings.

Sec. 61. **Basement Placed Beneath Frame Building.** — A frame building may be raised for the purpose of erecting a basement story under the same, but the principal floor of such frame building shall not be raised to a higher level than six feet above the sidewalk grade for two-story buildings, or twelve feet high above the sidewalk grade for one-story frame buildings. The walls enclosing such basement shall be of masonry, and if the frame building is one story high, such walls shall not be less than eight inches thick, or if such frame building is two stories high, the basement walls shall not be less than twelve inches thick. The foundations of such walls are to be constructed as elsewhere herein stated under the head of foundations. It is provided, however, that no frame building shall be raised, for the purpose of constructing a basement under the same, to a greater height to the top of its roof, than that elsewhere herein given as the maximum height above grade for frame buildings. It is also provided that after there has been a basement story constructed under any frame building, such frame building shall not be raised again for any purpose whatsoever.

Sec. 62. **Buildings Inside Fire Limits.**—Within the fire limits of the City of Chicago, all buildings hereafter constructed, altered or enlarged, shall comply with the following:

Sec. 63. **Wooden Sheds - Requirements.**— Sheds not exceeding fourteen (14) feet in height from the ground at the highest part thereof, and not exceeding 256 feet in area, with an incombustible roof, may be constructed of wood; such sheds shall not be located on the front part of the lot, nor shall they be used as a dwelling, or an addition to a dwelling house, or for any business purpose whatever, nor shall more than one shed be erected on any one building lot of 25 feet.

Sec. 64. **Open Shelter Sheds—Height of Walls and Foundations.—Coal Sheds—Height—To be of Fireproof Material.**—Open shelter sheds may be constructed, provided they have incombustible roofing not over 15 feet high from the ground to the highest point of roof, and the roof supported on sufficient posts or piers. Such sheds shall have no enclosing walls or wooden floors. No fence shall be used for the back or side of such shed. If it is intended to enclose an open shelter shed the enclosing walls must be made of brick or of hollow tile. Such enclosing walls must have foundations extending to solid ground, and at least four feet below the surface of the ground. Provided, that coal sheds erected upon docks or navigable waters within said city, may be constructed not over thirty-five (35) feet high from the ground to the highest point of the roof, and when such shed shall be enclosed the enclosing walls shall be made of fireproof material.

Sec. 65. **Storage and Manufacture—Stables.—Hotels and Boarding Houses.—Residences.—Assembly Halls.—Class of Building Not to be Changed Without Conforming to Ordinance.**—As a means of reference in this ordinance, buildings erected within the fire limits (sheds and shelter sheds as before described being excepted) shall be divided into classes as follows:

Class I.—In this class shall be included all buildings devoted to the sale, storage or manufacture of merchandise, and all stables over 500 square feet area.

Class II.—This class shall embrace all buildings used as residences for three or more families, all hotels, all boarding or lodging houses occupied by twenty-five or more persons, and all office buildings.

Class III.—This class shall embrace all buildings used as residences for one or two families, or for less than twenty-five persons, and stables under 500 square feet area.

Classes IV and V.—These shall include all buildings used as assembly halls for large gatherings of people, whether for purposes of worship, instruction or entertainment.

If buildings, the uses of which bring them within any of the before mentioned classes, are to be applied to the uses of any other class for which a better system of construction is called for by this ordinance, the construction and equipment of such buildings must first be made to conform to the requirements of this ordinance as specified for their intended use. And it shall be unlawful to apply such building to a new or different use than that to which its structure and equipment adapts it under this ordinance, unless the requirements of this ordinance for such new or different use shall first have been complied with, and a permit for such alteration of use shall have been first obtained from the Commissioner of Buildings.

Sec. 66. **Definition of Terms—Fireproof Construction.—Materials for Fireproofing.—Window Mullions.**—In describing the construction of the buildings belonging to the various classes before enumerated, the following definitions of terms shall apply throughout this ordinance:

The term "Fireproof Construction" shall apply to all buildings in which all parts that carry weights or resist strains, and also all stairs and all elevator enclosures and their contents ar made entirely of incombustible material, and in which all metallic structural members are protected against the effects of fire by coverings of a material which must be entirely incombustible and a slow heat conductor. The materials which shall be considered as fulfilling the conditions of fireproof covering are: First, brick; second, hollow tiles of burnt clay, applied to the metal in a bed of mortar, and constructed in such a manner that there shall be two air spaces of at least three-fourths of an inch each by the width of the metal surface to be covered, within the said clay covering; third, porous terra cotta, which shall be at least two inches thick, and shall also be applied direct to the metal in a bed of mortar.

In buildings of this type all door or window mullions, whether vertical or horizontal, shall be faced with cast iron, terra cotta or other incombustible material of equal fire-resisting values.

Sec. 67. **Skeleton Construction.—Where Cast-Iron Pillars are Used—Requirements.—Fireproof Construction where Walls do Not Carry Floors or Roof.**—The term "Skeleton Construction" shall apply to all buildings wherein all external and internal loads and strains are transmitted from the top of the building to the foundations by a skeleton or framework of metal. In such metal framework the beams and girders shall be riveted to each other at their respective junction points. If pillars made of rolled iron or steel are used, their different parts shall be riveted to each other, and the beams and girders resting upon them shall have riveted or bolted connections to unite them with the pillars. If cast-iron pillars are used, each successive pillar shall be bolted to the one below it by at least four bolts, not less than three-fourths inch in diameter, and the beams and girders shall be bolted to the pillars. At each line of floor or roof beams, lateral connection between the ends of the beams and girders shall be made by passing wrought-iron or steel straps across or through the cast-iron column, in such manner as to rigidly connect the beams and girders with each other in the direction of their length. These straps shall be made of wrought iron or steel, and shall be riveted or bolted to the flanges or to the webs of the beams and girders.

If buildings are made fireproof entirely, and have skeleton construction so designed that their enclosing walls do not carry the weight of floors or roof, then their walls shall

be not less than twelve inches in thickness; and provided, also, that such walls shall be thoroughly anchored to the iron skeleton; and provided, also, that wherever the weight of such walls rests upon beams or pillars, such beams or pillars must be made strong enough in each story to carry the weight of wall resting upon them without reliance upon the walls below them. All partitions must be of incombustible material.

Sec. 68. **Slow-burning Construction Defined.—Fireproof Covering of Posts and Elevator Enclosures.**—The term "Slow-burning Construction," shall apply to all buildings in which the structural members which carry the loads and strains which come upon the floors and roof thereof are made wholly or in part of combustible material, but throughout which the combustible as well as the incombustible materials shall be protected against injury from fire, by coverings of incombustible, non-heat-conducting material similar to those described under the head of "skeleton construction," except that a single covering of plastering on metal lath and metal furring shall be considered sufficient protection for the underside of joi ts, and that a deafening of mortar or its equivalent applied at least one and one-half inches thick shall be used to cover all floors and roof surfaces above the joists of the same. Where oak posts of greater sectional area than one hundred square inches are used, they need not have special fireproof covering. All partitions and all elevator enclosures in buildings of this type shall be made entirely of incombustible material. The use of wood furring or of stud partitions shall not be allowed in buildings of this class.

Sec. 69. **Mill Construction Defined.—Fireproofing.**—The term "Mill Construction," shall apply to all buildings in which all the girders and joists supporting floors and roof have a sectional area of not less than seventy-two square inches, and above joists of which there is laid a solid timber floor of thickness not less than three and three-fourths inches thick. Wooden posts used in buildings of this class shall not be of smaller sectional area than one hundred square inches. Partitions and elevator enclosures in buildings of this class shall be made entirely of incombustible material. If iron pillars, girders or beams are used in buildings of this class, they shall be protected as provided for fireproof buildings; but the wooden posts, girders and joists need not be protected by fireproof covering. The use of wood furring, wood laths or stud partitions shall not be permitted in buildings of this class.

Sec. 70 **Ordinary Construction Defined.**—By the term "Ordinary Construction," as used in this ordinance, is meant the ordinary system of construction in which timber and iron structural parts are not protected with fire-resisting coverings.

Sec. 71. **Materials.**—Materials used in the construction of buildings of all classes shall conform to the following specifications:

Sec. 72. **Foundation Proportions.—Foundations—How Constructed.**—Foundations shall be proportioned to the actual average loads they will have to carry in the completed and occupied building, and not to theoretical or occasional loads.

Foundations shall be constructed of either of the following: Cement concrete, dimension or rubble stones, sewer or paving bricks. If iron or steel is used, filling and coating of same shall be of Portland cement; timber piles covered with grillage of oak timber or concrete. It being provided that where oak grillage is used the top of such grillage must be at least one (1) foot below city datum; wherever sewers in adjoining streets or alleys are below city datum then the top of such oak grillage must be at least one (1) foot below the bottom of such sewers.

Sec. 73. **Pile Foundations—Borings Required—Safe Load Required—Fiber Strain.**—Where pile foundations are used, borings of soil shall first be made to determine the position of the underlying stratum of hard clay or rock, and the piles shall be made long enough to sustain the required load according to approved formulas for pile driving, and such piles shall not be loaded more than 25 tons to each pile. The heads of the piles are to be protected against splitting while they are being driven, and after having been driven the piles are to be sawed off to uniform level and covered with an oak timber grillage, so proportioned that in the transmission of strains from pile to pile the extreme fiber strain in the timbers composing the grillage shall not be more than twelve hundred pounds to the square inch.

Sec. 74. **Foundations Other than Pile.**—If foundations of other materials than piles are used, they shall be so proportioned that the loads upon the soil shall not exceed the limits for different kinds of soil than those hereafter given, to-wit:

Sec. 75 **Load for Clay Fifteen Feet Thick.**—If the soil is a layer of pure clay at least fifteen feet thick, without admixture of any foreign substance excepting gravel, it shall not be loaded more than at the rate of 3,500 pounds per square foot. If the soil is a layer of pure clay at least fifteen feet thick and is dry and thoroughly compressed, it may be loaded not to exceed 4,500 pounds per square foot.

Sec. 76. **Load for Sand Fifteen Feet Thick.**—If the soil is a layer of dry sand fifteen feet or more in thickness, and without admixture of clay, loam or other foreign substance, it shall not be loaded more than at the rate of 4,000 pounds per square foot.

Sec. 77. **Load for Mixed Soil.**—If the soil is a mixture of clay and sand, it shall not be loaded more than at the rate of 3,000 pounds per square foot.

Sec. 78. **Foundations in Wet Soil—Trenches to be Drained.**—In all cases where foundations are built in wet soil, it shall be unlawful to build the same unless the trenches in which the work is being executed are kept free from water by bailing, pumping or otherwise, until after the completion of work upon the foundations.

Sec. 79. **Foundation—Where Not Permitted.**—Foundation shall not be laid on filled or made ground, or on loam, or on any soil containing admixture of organic matter.

Sec. 80. **Depth Below Surface - Least Limit.— Depth Regulated by Sewer—Exceptions.—Sewer Connections to be First Laid.—Foundation of Brick Wall Upon Wooden Sills.—Level of Sills Allowed.**—Foundations must in all cases extend at least four feet below the surface of the ground upon which they are built, and in the case of all buildings forty feet or more in height, foundations shall extend at least to the depth drained by the street sewer in the neighboring streets or alleys; but if such sewers are at a greater depth than ten feet below the sidewalk grade, such foundations need not extend to a greater depth than ten feet, provided that sound, hard soil is found at that depth. In all cases a connection with the street sewer shall be established before beginning the work of laying foundations; excepting and providing that buildings not exceeding one story in height and eighteen feet in height from top of sills to highest point of roof, and side walls not exceeding twelve feet in height, and floor area not exceeding 1,200 feet in superficial area, may have brick walls not less than eight inches in thickness, erected on wooden sills, the sills supported on vertical posts, or piers, sunk four feet below the surface of the ground. The foundations under such posts or piers shall be of wood or stone, each covering not less than five square feet area to support the weight that may rest upon them with safety; sills to be placed not higher than one foot above the established grade on the street fronting the lot upon which the building is erected, where grades are established, and not exceeding six feet above the ground where grades are not established, the sills and space from sills to the ground to be protected with fireproof material.

Sec. 81. **Broken Stone—Sand.—Cement.—Concrete—Mortar—Foundations of.**—Broken stone for concrete in making foundations must be clean and free from dirt and dust. All sand must be free from admixture of loam, and must be otherwise clean and sharp.

Cement must have been kept dry, and must be used fresh from the package; cement which has been permitted to become wet, hard or lumpy before it is mixed into the mortar or concrete, shall not be used.

The use of concrete or mortar of all kinds, the ingredients of which are not thoroughly and completely mixed, and which are not free from lumps or other unmixed portions of any of the ingredients, is prohibited; and also the use of cement mortar which has become partly or wholly set before use. Concrete foundations wherever used must have boxes of plank all around them, and the concrete must be well rammed in individual layers not more than six inches each in thickness. The ramming must be continued until the water stands on the top of the mass of concrete.

Sec. 82. **Steel Rails on Beams in Concrete.**—If steel or iron rails or beams are used as parts of foundations, they must be thoroughly imbedded in a concrete, the ingredients of which must be such that after proper ramming, the interior of the mass will be free from cavities. The beams or rails must be entirely enveloped in concrete, and around the exposed external surfaces of such concrete foundations there must be a coating of a standard cement mortar not less than one inch thick.

Sec. 83. **Concrete Foundations—Steps—Safe Load Where Reinforced by Beams.**—If concrete foundations are used by themselves and without the insertion of iron or steel beams or rails, the offsets on top of same shall not be more than one-half the height of the respective courses, and such concrete foundations must not be loaded more than 8,000 pounds per square foot. If reinforced by iron or steel beams or rails, the loads and offsets in the same must be so adjusted that the fiber strain upon the metal, if iron, shall not exceed 12,000 pounds per square inch, or, if steel, that the fiber strain shall not exceed 16,000 pounds per square inch.

Sec. 84. **Dimension Stone.—Safe Load.**—Dimension stones must have uniform beds, and the offsets in the same, where two or more layers are used, must not be more than three-quarters of the height of the individual stones. They must be set with full beds of cement mortar under their entire area, and in such manner that they will not rock after being set. Dimension stone in foundations shall not be subjected to a load of more than 10,000 pounds per square foot in piers.

If the beds of the stones are dressed and leveled off to uniform surface and the stones are set in a standard cement mortar, this strain may be increased to 14,000 pounds per square foot.

Sec. 85. **Rubble Stone.**—Rubble foundations and rubble walls must be built of approximately square and flat-bedded stones, well and thoroughly bonded in both directions

of the walls, each stone thoroughly bedded in mortar under its entire area. Wherever walls of any kind are used as curb walls, their exterior surfaces must be rendered approximately water-tight by a coating of a standard cement mortar.

Sec. 86. **Use of Soft Brick — Bond — Safe Load.** — The use of soft bricks is prohibited in all parts of buildings exposed to the weather and in internal or external piers. The bond of brickwork shall be formed by laying one course of headers for every five courses of stretchers. Brickwork in walls laid in a standard Portland cement mortar shall not be loaded more than 25,000 pounds per square foot. Brickwork laid in an ordinary cement mortar shall not be loaded more than 18,000 pounds per square foot. Brickwork in walls laid in lime mortar shall not be loaded more than 13,000 pounds per square foot.

Sec. 87. **Walls — Ledges.** — Whenever walls sixteen inches or less in thickness shall be used for the support of ordinary joists in buildings of Classes I, IV and V, ledges four inches wide shall be formed for the support of such joists. Wherever in buildings of Class II joists rest upon walls twelve inches or less in thickness, ledges four inches wide shall be formed for the support of such joists. Wherever in buildings of Class III joists rest upon enclosing or upon party walls eight inches thick there shall be ledges projecting two (2) inches from such walls, and the joists shall not extend into the main walls more than two (2) inches. In buildings of all classes where furring strips, whether combustible or incombustible, are used on brick walls, there shall be ledges equal to the thickness of such furring strip upon such walls, and in all cases where ledges are built, they are to be carried up to and leveled off on the line of the tops of the joists.

Sec. 88. **Pressed Brick Facing — Bond Joints.** — If pressed brick facing are used, they must be bonded into their backing every seventh course. Bond shall be established by solid headers, or by blind headers, or by means of metallic anchors. In the case of piers faced with pressed brick, only solid headers shall be used, but bond stones or iron bond plates may be substituted for such headers. Pressed brick in all cases must be so laid as to have full bearing of mortar under its entire surface. The laying of pressed brick merely with a joint all around the outer edge of the bricks shall be unlawful.

Sec. 89. **Brick Piers — Offsets — Bond Stone — Cap Stone.** — In building brick piers, there shall be provided at every offset in each pier, or at every point where such brick pier receives the load, a bond stone at least eight inches thick, and at the top of each pier a capstone at least ten inches thick, or in all such cases a bond plate of cast or rolled iron, which stones or plates if at the top of such piers shall cover the entire surface of such pier, and shall in all cases be adapted to receiving the load to be imposed and shall be made of a strength which will keep the fiber strain upon the material used within the limits elsewhere herein stated.

Sec. 90. **Arches for Support of Floors.** — Hollow tile and porous terra cotta may be used in the form of flat arches for the support of floors and roofs; such floor arches having a height of at least two inches for each foot of span. The arches must be so constructed that the joints of the same point to a common center; the butts of the arches shall be carefully fitted to the beams supporting them; and there shall be a cross rib for every six inches or fractional part thereof in height; and in addition to these there shall also be diagonal ribs in the butts. Floor arches made in the form of a segment of a circle or ellipse must be constructed upon the same principle. Such arches, whether flat or curved, shall have their beds well filled with mortar, and the centers shall not be struck until the mortar has been set.

Where hollow tile blocks are used for building partitions or as enclosing walls, the joints shall be well filled with mortar.

Sec. 91. **Stone Facing Without Bond Courses. — Stone Facing With Bond Courses.** — Stone may be used as facing for brick walls under the following conditions: If the facing is ashlar, without bond courses, and the individual courses thereof measure in height between bond stones more than six times the thickness of the ashlar, then each piece of ashlar facing shall be united to the brickwork with iron anchors at least two to each piece and reaching at least eight inches over the brick wall, and hooked into the stone facing as well as the brick backing. Wherever ashlar as before described is used, it shall not be counted as forming part of the bearing surface of the wall, and the brick backing shall be of the thickness of wall herein specified for the different kinds of building.

If stone facing is used with bond courses at a distance apart of not more than four times the thickness of the ashlar, and where the width of bearing of the bond courses upon the backing of such ashlar is at least twice the thickness of the ashlar, and in no case less than eight inches, then such ashlar facing shall be counted as forming part of the wall, and the total thickness of wall and facing shall not be required to be more than herein specified for walls of the different classes of buildings.

Sec. 92. **Stresses — Cast-Iron Fiber — Strains — Length. — Stresses in Pounds per Square Inch.** — The stresses in materials hereafter used in construction produced by the calculated strains due to their own weight and applied loads, shall in no case exceed the following:

CAST IRON.

Extreme fiber strains tension..... 2,500 lbs.
For columns..... .....10,000 lbs.

Reduced by Gordon's formula. Reduced for eccentric load.

No cast-iron column shall have a length to exceed twenty times its diameter, or least side.

STRESSES IN POUNDS PER SQUARE INCH.

	Wrought Iron.	Steel.
Extreme fiber stresses. I beams and shapes	12,000	16,000
Extreme fiber stresses, built beams	10,000	15,000
Tension	12,000	15,000
Shearing	7,500	10,000
Direct bearing pins and rivets	15,000	20,000
Bending on pins	18,000	22,500
*For columns and compression members	12,000	15,000

*Reduced for ratio of length of column to its last radius of gyration by approved modern formulae. Reduced for eccentric load.

Sec. 93. **Timber—Stresses in Pounds per Square Inch.—Posts—Stresses per Square Inch.—**

TIMBER—STRESSES IN POUNDS PER SQUARE INCH.

	On Extreme Fiber.	Shearing Along Grain.	Compression Perpendicular to Grain.
White pine and spruce	750	80	150
White oak	1,000	150	250
Long-leaved yellow pine	1,250	100	250

POSTS WITH FLAT ENDS.

L. Length of post in inches.
D. Least side or diameter of post in inches.
S. Stress per square inch.

White Pine and Spruce.			L. L. Yellow Pine.			White Oak.
L. D.	S.		L. D.	S.		S.
0-10	625	....	0-15	1,000	....	750
10-35	500	....	15-30	875	....	650
35-45	375	....	30-40	750	....	500
45-50	250	....	40-45	625	....	400
....	...	....	45-50	500	....	375

Sec. 94. **Fireproofing Defined.—Protection of Steel.—Support of Fireproofing for Same.**—Fireproofing of the steel and iron structural parts of buildings shall, for the purposes of this ordinance, be defined as follows:

All iron or steel used as a supporting member of the external construction of any building exceeding 90 feet in height, shall be protected as against the effect of external changes of temperature and of fire, by a covering of brick, terra cotta or fire clay tile, completely enveloping said structural members of iron and steel. If of brick, it shall not be less than 8 inches thick. If of hollow tile, it shall not be less than 8 inches thick, and there shall be at least two sets of air spaces between the iron and steel members and the outside of the hollow tile covering. In all cases, the brick or hollow tile shall be bedded in mortar close up to the iron or steel members, and all joints shall be made full and solid.

Wherever stone facing is used, it shall be an additional thickness to the column covering above specified.

Where skeleton construction is used for the whole or part of a building, these enveloping materials shall be independently supported on the skeleton frame for each individual story.

Sec. 95. **Iron or Steel Plates for Support of Fireproofing.**—If iron or steel plates are used in each story for the support of this covering within the said story, such plates must be of sufficient strength to carry within the limits of fiber strain for iron and steel elsewhere specified in this ordinance, the enveloping material for the said story, and such plates may extend to within two inches of the exterior of said covering.

Sec. 96. **Backing for Terra Cotta.**—If terra cotta is used as part of such fireproof enclosure, it shall be backed up with brick or hollow tile; whichever is used, being, however, of such dimensions and laid up in such manner that the backing will be built into the cavities of the terra cotta in such manner as to secure perfect bond between the terra cotta facing and its backing.

Sec. 97. **Horizontal Filling—Thickness.**—The horizontal filling between the iron and steel vertical members of skeleton constructions shall be of brick or terra cotta, and in no case of less thickness than 12 inches, subject to the same conditions as to bond and

courses as specified for the enveloping material of structural members, and these horizontal fillings shall be bonded into the enclosures of the vertical members.

Sec. 98. **Top Covering.**—The upper surfaces of all breaks or offsets in external coverings and fillings and walls, as well as the tops of walls, shall be covered with stone, terra cotta or fire clay copings set in cement mortar, and having lapped joints pointed with cement.

Sec. 99. **Internal Covering.**—The internal structural parts of buildings of the skeleton construction shall be fireproofed by coverings of brick, hollow tile, or porous terra cotta.

Sec. 100. **Covering of Interior columns.**—In the case of buildings of Class I, the coverings of interior columns shall be, if of brick, not less than 8 inches thick; if of hollow tile, these coverings shall be in two consecutive layers, each not less than 2½ inches thick. If the fireproof covering is made of porous terra cotta, it shall consist of at least two layers not less than two inches thick each. Whether hollow tile or porous terra cotta is used, the two consecutive layers shall be so applied that neither the vertical nor the horizontal joints in the same shall be opposite each other, and each course shall be so anchored and bonded within itself as to form an independent and stable structure.

In all cases there shall be on the outside of the tile a covering of plastering with any standard cement mortar or of other mortar of equal hardness and efficiency when set.

In all places where plastering is used in connection with fireproof construction, asbestos plastering or a material equally as good shall be used.

Sec. 101. **Protective Covering for Fireproofing.**—In places where there is trucking or wheeling or other handling of packages of any kind, the lower five feet of the fireproofing of such pillars shall be encased in a protective covering either of sheet iron or oak plank, which covering shall be kept continually in good repair.

Sec. 102. **Metallic Lath Fireproofing.**—In buildings of "slow burning" construction, if plastering or metallic lath be used as fireproofing for columns, it shall be in two layers. The metallic lath shall in each case be fastened to metallic furrings, and the plastering upon the same shall be made with cement. Protection for the lower five feet shall be required in this case the same as where porous terra cotta or hollow tile covering is used. In all places where plastering is used in connection with fireproof construction, asbestos plastering or a material equally as good shall be used.

Sec. 103. **Fireproof Coverings for Internal Columns in Class II.**—In buildings belonging to Class II, the fireproof covering for internal columns is to be made the same as specified for the buildings of Classes I, IV and V, excepting only that but one covering of hollow tile or porous terra cotta, and but two layers of any covering made of plastering on metallic lath, are to be used.

In all places where plastering is used in connection with fireproof construction, asbestos plastering or material equally as good shall be used.

Sec. 104. **Covering of Iron or Steel Beams, Classes I, IV and V.**—The fireproof covering of iron or steel beams and girders in buildings of Classes I, IV and V, shall be effected with either of the materials before specified. If hollow tiles are used, the tiles shall be set close to the metal to be protected, and there shall be two air spaces within the tile of at least ¾ of an inch each. If plastering on metal lath is used, the furring shall be also metal. There shall be two thicknesses of such plastering on metallic laths.

In all places where plastering is used in connection with fireproof construction, asbestos plastering or a material equally as good, shall be used.

Sec. 105. **Air Space.**—For buildings of Class II only one air space will be required in the fire protection covering.

Sec. 106. **Limitation in Changing Class of Building.**—If buildings of Class II are partly used for the purposes of Classes I, IV and V, the method of fireproofing the structural iron or steel in the whole of any story, any part of which is so used, and in the whole of the story above and below the same, shall be as called for in buildings of Classes I, IV and V.

Sec. 107. **Coverings of Beams.**—In all cases, the covering of beams, if of hollow tile or porous terra cotta, shall be so applied as to be supported entirely by the beams or girders protected, and shall be held in place entirely by the support of the flanges of such beams or girders, and by the mortar used in setting. Wire binding and anchors shall not be used as fastenings of such fireproof covering.

Sec. 108. **Arches as Filling Between Floor Beams.**—The filling between the individual iron or steel beams supporting the floors of fireproof buildings, shall be made of brick arches or concrete arches or hollow tile arches. Brick arches shall not be less than 4 inches thick, and shall have a raise of at least ¾ inches to each foot of span between the beams. If the span of such arches is more than 6 feet, the thickness of the same shall not be less than 8 inches. If hollow tile arches having a straight soffit are used, the thickness of such arches shall not be less than at the rate of 2 inches per each foot of span. If concrete arches are used, the concrete in the same shall not be strained more than 100 pounds per square inch if the concrete is made of crushed stone, nor more

than 50 pounds square inch if the concrete is made of cinders. In all cases, no matter what the material or form of the arches used, the protection of the bottom flanges of the beams, and so much of the web of the same as is not covered by the arches shall be made as before specified for the covering of beams and girders.

Sec. 109. **Walls—Thickness of.**—The thickness of walls hereinafter specified and set forth in the tables for the various classes of buildings, shall be, for each class of buildings, intended to apply to the external enclosing walls, and also to such internal walls as may be required under the specifications of the different classes of building for the support of floors and roofs.

Sec. 110. **Bay Windows and Light Shafts—Material for.**—Bay or oriel windows and light shafts may be built of combustible material only in the following cases: In buildings of Classes I, II and III, of four (4) stories or less in height, provided such bay and oriel windows or light shafts shall not have a greater width than twelve (12) feet at wall line of building, and that no such bay or oriel window or light shaft shall be more than three stories in height above the first or main story of such buildings, and provided that the outside walls, roofs and soffits of such bay or oriel windows and light shafts, when so constructed, shall be covered with sheet metal or other incombustible material. In all other cases, bay and oriel windows and light shafts shall be constructed entirely of incombustible material, and all supports thereof shall be so proportioned that the limit of stress on such supports shall not exceed those hereinbefore scheduled.

Sec. 111. **Limitations of.**—The limitations of bay and oriel windows projecting over the street line of one building and the number and position of any such bay or oriel windows on any building, shall be as follows:

First—No such bay or oriel window shall be at a less distance than twelve (12) feet from the sidewalk grade.

Second—No such bay or oriel window shall project more than three feet over a street line of any building.

Third—No such bay or oriel window shall have a greater street frontage than fifteen feet.

Fourth—There shall not be more than one bay or oriel window for any twenty feet of frontage, and no two bay or oriel windows shall be built nearer to each other than five feet. Nothing herein contained shall, however, limit the number and size of bay and oriel windows which are built in such a manner as not to project over the street line of the building of which they form a part; provided, such bay or oriel windows shall be built entirely of incombustible material.

Sec. 112. **Construction of Buildings.—Height of Buildings.**—Buildings of Classes I, II and III, which are 100 feet or more in height, shall be made entirely of fireproof construction.

Buildings of Classes I, II and III, less than 100 feet and more than 60 feet in height, shall be built entirely of slow-burning or mill construction.

Buildings of Classes I, II and III, less than 60 feet in height, may be built of ordinary construction.

The limits of heights of buildings, hereinbefore given for non-fireproof buildings, shall be from the sidewalk level to the highest point of roof thereof.

No building shall be erected in the City of Chicago of greater height than 130 feet from the sidewalk level to the highest point of external bearing walls.

Sec. 113. **Wind Pressure—Precautions Against.**—In the case of all buildings, the height of which is more than one and one-half times their least horizontal dimension, allowances shall be made for wind pressure which shall not be figured at less than 30 pounds for each square foot of exposed surface. In buildings of skeleton construction the metal frame must be designed to resist this wind pressure.

Sec. 114. **Basement—Meaning of.**—Wherever in this ordinance the word "basement" story is used, it is intended to mean that the floor of such story is at a distance of two feet or more below the level of the sidewalk, and that its height does not exceed eleven feet in the clear. If the floor of such story is nearer than two feet to the sidewalk grade, or if its height in the clear is more than eleven feet, it shall be counted as the first story of the building in which it occurs.

Sec. 115. **Enclosures Upon Roofs.—Parapets and Balustrades Upon Roofs.**—It shall be permitted to erect on the roofs of all buildings skylights, enclosures for water tanks and enclosures for elevator machinery, the construction of all of which enclosures shall be, if sixty feet or more above the sidewalk level, entirely of incombustible material.

The erection of parapet walls or of balustrades constructed entirely of incombustible material is permitted above the roof level of buildings of all classes, and in addition to the heights herein fixed for the same.

Sec. 116. **Fire Walls—When Dispensed With.**—Fire walls of brick not less than twelve inches thick shall be built extending above the roofs of all buildings if such roofs are flat, and also above the roofs of all buildings where the same abut against another building, or where the same stand upon any line of any lot, excepting street or alley

lines. Provided, that where 8-inch walls are permitted in the top story of buildings, the fire walls shall be of the same thickness. Such fire walls, where they stand upon lot lines or where they are over the dividing walls between buildings, or over the dividing walls in the interiors of buildings, where such are called for by this ordinance by reason of the great area of such building, shall extend at least three feet above the roofs of such buildings. Fire walls upon street and alley lines shall extend not less than eighteen inches above the roofs of such buildings. Fire walls may be dispensed with on street and alley lines if the tops of the roof boards and roof joists are protected as against fire for a distance of at least five feet from such street or alley lines by a coating of deafening mortar on hollow tile or porous tile at least two inches thick. Fire walls at street and alley lines may also be dispensed with in all cases where the entire framing and material of the roof shall be made strictly fireproof.

Walls facing upon courts and light shafts shall be treated in the same category with walls facing upon streets and alleys.

Fire walls must be covered with a weatherproof coping of incombustible material.

Sec. 117. **Incombustible Window and Door Sills.**—Window and door sills shall be made of incombustible material. Oak timber used for door sills and not less than eight inches thick by the full width of the wall in which such sills occur, shall, for the purpose of this ordinance, be counted incombustible, but no other form or use of wood construction shall be considered incombustible.

Sec. 118. **Pillars and Lintels Supporting Store Fronts.**—The pillars and lintels supporting store fronts shall not be made of wood in buildings more than twenty-five feet above the sidewalk grade.

Sec. 119. **Shingle Roof.—Gravel Roof.—Construction of Roofs.—Pitch of Roofs.—Rise of Roof Above Limit of Height.**—The use of shingle roofs or of other forms of combustible roof covering upon buildings erected or altered within the fire limits is prohibited.

Roofs whose slope is not more than three inches per foot horizontal, and the covering of which is made with a composition of felt and gravel, shall be considered incombustible under the provisions of this ordinance, and may be used upon buildings of all classes.

In the case of all buildings less than sixty feet in height, roofs having a slope of more than that specified for composition roofs may be made of timber and board construction, and shall be covered with slate or glazed tile or metal. The roofs upon buildings sixty or more feet and less than ninety feet high, and of greater slope than three inches to the foot, and less slope than thirty degrees with the horizon, shall, if made of timber construction, have a fireproof covering upon the roof boards, which shall be made either of mortar or porous terra cotta or plaster boards, and which shall be at least two inches thick. If this covering is made upon the roof boards, wooden strips shall be inserted and securely fastened to the wooden substructure at regular intervals between the fireproof covering, and a weatherproof covering of sheet metal, state or glazed tile shall be securely fastened thereto.

In the case of buildings which are entirely fireproof in their construction and of which the roof is also entirely of fireproof construction, the roof may rise above the limit of height of wall fixed by this ordinance for such buildings at a slope not to exceed thirty degrees with the horizon, and to a height not exceeding ten feet above limitation of height of such wall. The space enclosed by such roof above the legal limitation of the height of such wall may be used as an enclosure for pipes, ventilating or elevator machinery, or for ventilating ducts, but it shall not be lawful to use said attic space for purposes of storage, business or residence.

Sec 120. **Pipes Carrying Water from Roof.**—The water from all roofs shall be carried to the street sewers in metal conductor pipes, which must be continually maintained in such condition that leaks therein will not cause the water to soak into the walls or any other part of the building.

Sec. 121. **Cornices — Gutters — Eaves — Parapets — Bay Windows.** — Where sheet metal cornices or external sheet metal gutters are used, their entire framework and covering shall be of metal, and the walls shall extend behind all such cornices or gutters along their entire height. All metal work in and about any cornice, gutter, eave or parapet, or in or about any bay, or oriel window, shall be supported by suitable brackets placed not more than four feet apart and firmly secured to the wall. Wood shall not be used as the support of any gutter or cornice for buildings of one hundred feet or more in height.

Sec. 122. **Towers, Domes and Spires—Construction of.**—Towers, Domes and spires may be built on top of the roofs of buildings of Classes I, II and III but shall not occupy more than one-fourth of the street frontage of any building, and none shall in any case have a base area of more than 1,600 square feet. And such towers, domes or spires, if any part thereof is built to a height of more than sixty feet and less than ninety feet, shall be of slow-burning construction, and if of greater height than ninety

feet above the sidewalk shall be of fireproof construction; and in all cases where the area of such spire, dome or tower exceeds one hundred square feet, its supports shall be carried down to the ground, and shall be, if the construction supported is more than sixty feet and less than ninety feet high, of slow-burning construction, and if more than ninety feet high, of fireproof construction.

Sec. 123. **Skylights—Construction of.—Glass in.**—Any skylight on the roof of any buildings of Classes I and IV and Class II over two stories in height, shall have the sides, sashes and frames constructed of metal; or of wood metal clad on all exterior surfaces.

The glass in all skylights shall have, at least six inches over same, a strong wire netting (wire not lighter than No. 8 and mesh not coarser than 1½ inch by 1½ inch), unless the glass contains a wire netting within itself.

Sec. 124. **Projection of Cornices—Belt Courses—Balconies.—Verandas—Porticos—Balconies—Construction of.** No cornice, belt course or balcony shall project more than three feet over the street line of any building, nor be less than twelve feet above sidewalk grade, and no cornice, balcony, string course, portico or veranda, if projecting over the street line of any building, shall be built in its entirely of other than incombustible material. It shall, however, be permitted to build verandas, porticos and balconies upon buildings less than sixty feet in height of combustible material, provided that no part thereof projects over the street line of the buildings of which they form part.

If verandas or porticos are to be enclosed the filling or enclosing walls must be made of incombustible material, the only exception being in case such porticos or verandas are to be made part of a storm house or of a storm door enclosure, which, however, shall in no case be more than twelve feet high, nor shall it occupy a greater frontage than two feet more than the width of the inner doors for which the storm doors are made. Permits for the erection of such storm houses or storm door enclosures may be issued subject to the provision that the same shall be maintained only from the first of November to first of May following, and that the storm house or storm door enclosure, for which such permit is issued, shall not be used for the display of merchandise or any other thing whatsoever, but shall be used only for protection from severe and inclement weather. Such storm houses or storm door enclosures shall not extend more than three feet beyond the building line of the building in front of which the same shall be erected. The fee for each permit for storm house or storm door enclosure shall be two ($2) dollars.

Sec. 125.—**Sidewalks—Occupation of by Parts of Buildings.**—The use of any part of the sidewalks for steps or for open areas is prohibited, but porticos or other entrance features, if not more than thirty feet in height, may be made to project upon the sidewalk thirty inches, but no more. Provided, that where sidewalk space is less than fourteen feet, no projection shall be permitted, and provided that such projection shall only be as an architectural feature and shall in no case be used as a show window, vestibule or for business purposes.

The foregoing prohibition for the use of sidewalk space for steps or areas shall not apply to existing buildings, but if material alteration in or additions to existing buildings are to be made, then such steps and open areas shall be made to conform to the provisions of this ordinance.

Sec. 126 **Space Beneath Sidewalks.**—In all cases where the space under sidewalks is connected with the basement of any building, the covering of the same and all the supports of such covering shall be made entirely of incombustible material, and the occupant of such space under any sidewalk shall be considered and treated as the tenant at will of the City of Chicago.

Sec. 127. **Height Above Roof.—Interior Chimneys—Walls of.—Flues—Height Above Roof.—Flues—Linings of.—Interior Chimneys—Framing Around.**—No chimney shall be built with less than four (4) inches thick brick walls, and no chimney having a greater flue area than 260 square inches shall have walls less than eight (8) inches thick; provided that in all cases where chimneys are built with walls less than eight inches thick the same shall have flue liners of fire clay or terra cotta in their entire length.

All chimneys having an area of not more than 260 square inches or less, shall be carried up to at least five feet above the highest part of roof of the building of which it is a part, if such roof is a flat roof. If the roof is a pitched roof, the chimney shall be carried up at least two feet above same.

Chimneys having a greater flue area than 600 square inches shall have surrounding walls of at least sixteen inches of brickwork, and such walls shall be built hollow with at least four inches hollow space in such walls. At a height of fifty feet above smoke inlet the thickness of the surrounding brickwork can be reduced to twelve inches, but in all cases the surrounding walls of chimneys of this or any other size shall be so proportioned that the brickwork in same will not be subject to a greater stress than elsewhere herein fixed as the maximum safe stress for brickwork. For chimneys having a greater flue area than 1,600 square inches the thickness of walls shall be increased above the thickness above specified, four inches for each increase of 1,000 square inches or fractional part thereof.

All flues having a greater area than 250 square inches and not more than 600 square inches, shall be carried up at least twelve feet above highest point of roof of building of which they form part; and all flues having a greater area than 600 square inches and not more than 900 square inches, shall be carried up at least twenty feet above highest point of roof. All chimneys having a greater area than 900 square inches shall be carried to a height of at least twelve feet above any roof within a radius of sixty feet: provided, that the top of such chimney shall not be less than twenty feet above the roof of the building of which it forms a part.

All flues having a greater area than 400 square inches shall be lined on the inside with fire brick laid in fire clay, which lining shall start at least two feet below the smoke inlet, and for flues having an area of from 400 to 600 square inches shall extend twelve feet above smoke inlet, and for all flues of more than 500 square inches and not more than 1,600 square inches, shall extend twenty feet above smoke inlet, and for all flues having a greater area than 1,600 square inches shall extend at least thirty feet above smoke inlet. If an internal smoke pipe of cast-iron or steel is used, so much of the brickwork as is inside of the insulating cavity of the stack may be omitted. Wrought-iron or steel smoke stacks shall, however, be lined with fire brick for at least thirty feet of their height.

No joists or girders shall rest and be supported on the walls of any chimney, and the framing around chimneys of all kinds shall be so constructed that in no case will any joists or timbers be placed nearer than two inches from the outside face of walls of flues, and in no case shall the distance from the inside of any flue to any joists or timbers be less than eight inches, where flue liners are used, and twelve inches where flue liners are omitted.

The foregoing applies only to chimneys which are enclosed by, or form part of, the interior of any building.

Sec. 128. **External Chimneys—Location of.—Walls of Abutting Building.—Built of Iron or Steel. - Isolated Chimneys. — Foundation of Smoke Stacks.** — Chimneys may be built outside of the walls of existing buildings (but not in such manner as to encroach upon any street or alley) and shall be built as follows:

If at least one side of such chimney abuts entirely upon the wall of an existing building and the chimney is throughout its entire length securely and firmly anchored to the walls of said existing building, the wall of such chimney may be built of hollow tiles, in which case, however, it shall have a cast-iron base, lined with fire brick, and extending to a height of at least ten feet above the street or alley grade.

Such external chimney may also be built of rolled steel or iron of not less than one-fourth inch thick and lined with fire bricks, laid in fire clay, for at least forty feet above street or alley grade, or it may be built throughout its entire height of cast iron, in which case the first ten feet above street or alley grade shall be lined with fire brick, laid in fire clay.

If isolated chimneys are built, they shall also have hollow walls, and shall be so designed and constructed that the stress upon any part thereof, due from the weight of the stack itself and from wind pressure, shall never exceed the limits elsewhere in this ordinance fixed as the maximum stress for brick masonry.

The foundations of smoke stacks, whether inside or outside of buildings, or whether connected with the same or isolated, shall be designed and built in conformity with the provisions relating to foundations of buildings hereinbefore given.

Sec. 129. **Metallic Chimneys Passing Through Floors and Roofs.**—Metallic chimneys or smoke pipes shall not be used inside of any building in such manner as to pass through the floors or roofs of the same, unless such metallic smoke pipes or chimneys are enclosed in brick or tile walls, with an air-space between the enclosing walls and the smoke pipe from bottom to top.

Sec. 130. **Smoke Pipes Passing Through Partitions. — Smoke Flues — Woodwork Around.**—Where smoke pipes of diameter twelve inches or less pass through a wood or a plastered stud partition, they shall be surrounded either by a body of brick, hollow tile, porous terra cotta or other substance, measuring at least eight inches all around such smoke pipe.

Smoke flues of less diameter than twelve inches shall be kept at least twelve inches distant from any woodwork, and such woodwork immediately over and for a distance of two feet on each side of such smoke pipe must be covered with sheet metal or with porous terra cotta or hollow tile or with plaster.

Smoke pipes of greater diameter than twelve inches and less area than six square feet, must be kept at least twenty inches away from any woodwork, and such woodwork must be protected as before specified for the smaller smoke pipes to a distance of four feet on each side of such smoke pipe.

Wherever smoke pipes of larger area than six square feet are used they shall be kept at least three feet distant from any woodwork, and such woodwork for a distance of at least six feet on either side of said smoke pipe shall be protected as before specified for smaller pipes.

Sec. 131. **Floors, Protection of—Around Boilers, Furnaces, Etc.—Ceiling, Protection of—Around Boilers, Furnaces, Etc.**—Wherever steam boilers or furnaces or ovens, coffee roasters or other structures in which fires are maintained, are set inside of a building or in a room with wooden floor or ceiling construction, the floor of the same shall be protected by a covering of brick or concrete not less than five inches thick set in mortar upon a continuous sheet-metal bearing plate not less than 3-16 of an inch thick, all the joints of which are to be securely riveted and the edges of which are to be turned up five inches all around. This foundation of sheet metal and brick and concrete shall extend under the whole of the fire box and ash pit of such steam boiler or furnace or other structure, and to a distance of not less than ten feet in front and at least four feet on the other three sides of the same. The space between the tops of such steam boilers or furnaces and any wood ceiling construction shall in no case be less than three feet, and the under side of such wood ceiling construction shall in all cases be protected either by two consecutive coatings of plastering on metallic lath or wire netting, which shall be kept at least two inches distant from each other, and which metallic lath or wire netting shall be applied by means of metal furring strips, or this protection of the woodwork shall be made by a covering of at least two inches of porous terra cotta plastered on the under side, or by a covering of hollow tile with two air spaces at least ¾ inch each between the wood and the under surface thereof, which under surface shall also be covered with a heavy coat of plastering.

Sec. 132. **Cupolas of Foundries.** Cupolas of foundries shall extend at least ten feet above the highest point of any roof within a radius of forty feet of such cupola and shall be covered on top with wire netting.

Sec. 133. **Pipes for Distribution of Hot Air.**—Where pipes are used for the distribution of hot air in buildings, such pipes must be made of metal and double. The space between the two metal pipes shall be at least ½ inch. Such pipes are to be made with air-tight joints and to be securely fastened to the partitions through which they pass.

Sec. 134. **Registers—Openings in Floor For.—Material for Ducts, Pipes and Registers.**—The openings in floors for hot air registers shall be surrounded with borders of incombustible material not less than two inches wide, and firmly and securely set in place, and bedded in plaster of paris. The register boxes shall be double, the distance between the two thicknesses of tin being at least one inch.

Where the air conveyed through pipes is heated in an ordinary hot-air furnace, or in any other apparatus, by direct contact of the air with a fire box, the material used for these double ducts, pipes and register boxes shall be in bright tin, and the joints shall be double-seamed, but not soldered. Where the air is heated by contact with hot water or steam pipes, any other sheet metal may be used for the pipes, and the use of double pipes is not obligatory.

Sec. 135. **Thickness of Walls of Class I.**—The following regulations shall govern the construction of buildings belonging to Class I:

The thickness of their surrounding walls and of all dividing walls in the same, carrying the load of floors or roof, shall be made as indicated in the following table, to-wit:

	Basement.	STORIES.											
		1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.
One-story	12	12	....	....	....	....	....	....	....	....	....	....	....
Two-story	16	12	12	....	....	....	....	....	....	....	....	....	....
Three-story	16	16	12	12	....	....	....	....	....	....	....	....	....
Four-story	20	20	16	16	12	....	....	....	....	....	....	....	....
Five-story	24	20	20	16	16	16	....	....	....	....	....	....	....
Six-story	24	20	20	20	16	16	16	....	....	....	....	....	....
Seven-story	24	20	20	20	20	16	16	16	....	....	....	....	....
Eight-story	24	24	24	20	20	20	16	16	16	....	....	....	....
Nine-story	28	24	24	24	20	20	20	16	16	16	....	....	....
Ten-story	28	28	28	24	24	24	20	20	20	16	16	....	....
Eleven-story	28	28	28	24	24	24	20	20	20	16	16	16	....
Twelve-story	32	28	28	28	24	24	24	20	20	20	16	16	16

Sec. 136. **Stairs, Shafts, Shaving Pits—Walls Surrounding.—Ventilating Ducts, Chutes—Walls Surrounding.**—The walls surrounding stairs, and also the walls of elevator shafts and shaving pits, shall not be less than eight inches thick, and their thickness shall be increased with increase of height to a sufficient extent to keep the load on the brickwork within the maximum load elsewhere herein specified. No. 8-inch wall shall be more than two stories high and not more than twelve feet high between lateral supports. Walls surrounding ventilating ducts, and rubbish and ash chutes, shall be constructed in

accordance with the regulations governing the construction of smoke flues elsewhere herein contained.

Sec. 137. **Exception to Table of Thickness of Walls.**—If buildings of Class I are erected of less depth than 100 feet from front to rear or between cross walls, or if the walls supporting their floors and roofs are less than twenty-five feet apart, the thickness of the walls given in the aforesaid table may be reduced by four inches, excepting only that no wall in such buildings shall be less than twelve inches thick.

Sec. 138. **Ice Houses.**—Houses to be used exclusively for the storage of ice may be constructed of wood with incombustible roofing, the walls to be enclosed with an envelope of incombustible material; 8-inch brick walls with proper foundations of masonry may be used for such envelopes; iron or slate may be used, but no coating of mineral substance, or "fireproof paint," so called, shall be considered as incombustible, and such houses shall be used for no other purpose than the storage of ice.

Sec. 139. **Stairs in Class I.**—In buildings of Class I, which are used as workshops or in which, if they are used as salesrooms, there is an occupation of the same at any time by 100 or more persons, there shall be at least two staircases, each not less than four feet wide. If the number of persons occupying such buildings exceeds 300, then the width of the stairs in the same shall be increased to five feet. If the number of persons occupying such premises exceeds 800, three stairways five feet in width each shall be constructed. And if the number of persons occupying such premises exceeds 1,200, they shall be governed as regards the number, size and construction of stairways, by the regulations laid down for buildings of Class IV.

In all cases the stairs shall be located at as great a distance as practicable from each other.

The foregoing specifications as to stairs apply to non-fireproof buildings only. For fireproof buildings, one less flight of stairs than above called for may be sufficient in each case, unless the floor area exceeds 7,000 square feet, in which case there shall not be less than two stairs in any building of Class I.

And no stairways shall hereafter be constructed around or alongside elevator shafts in buildings over four stories in height, unless said stairways are separated from the elevator shaft by a fireproof wall.

Sec. 140. **Stairs and Fire Escapes—Obstruction of.**—It shall be unlawful, under any circumstances, to close up or obstruct during the occupation for business purposes of any building, the stairs or fire escapes or the approaches leading thereto, and no change in the position or construction of either shall be made, unless the permission so to do of the Building Department first shall have been obtained.

Sec. 141. **Door Openings at Street Level—Class I.**—The aggregate width of door opening at the street level in buildings of Class I shall be equal to the aggregate width of stairways hereinbefore specified, and such doors shall not be locked during business hours or while such buildings are occupied by large numbers of people.

Sec. 142. **Increasing Height of Class I.**—In all cases where buildings of Class I, already built, of ordinary construction, are to be increased in height above the height of 60 feet or above the height of 100 feet, the additional parts of such buildings shall be constructed as herein provided for buildings over 60 feet high or over 100 feet high, respectively, and shall be made to conform in all respects and throughout their entire extent to the requirements of buildings of this class more than 60 feet or 100 feet high, respectively, before it shall be lawful to occupy them.

Sec. 143. **Space Between Ceiling and Roof of Class I.**—In buildings of Class I, if the enclosed space between the ceilings and the roof is of less average height than six feet, then the ceiling and roof and all the structural parts of the same are to be made either of "mill construction," or "slow burning;" and in all cases means of access satisfactory to the Fire Marshal shall be given to this space between ceiling and roof.

Sec. 144. **Doors and Windows When Provided with Shutters.**—Wherever the distance between doors and windows of buildings on opposite sides of alleys or courts shall be 30 feet or less, such door or window openings shall be provided with shutters made of iron, wire glass or prisms, not exceeding four inches square, glazed in fireproof metal. The wire glass or the prisms to be set in hollow iron frames.

Sec. 145. **Dividing Walls—When Required in Class I.**—Dividing walls will be required in buildings of Class I as follows: For buildings of ordinary construction if their floor area exceeds 9,000 square feet; for buildings of slow-burning or mill construction if their area exceeds 12,000 square feet; for fireproof buildings if their area exceeds 15,000 square feet. In each of the before mentioned cases such buildings shall be subdivided by brick walls built of the thickness given in the table for the thickness of enclosing walls, and all doors and other openings in such walls shall have iron doors or shutters at each side of same. And the buildings so subdivided shall be treated as regards stairs and fire escapes the same as two or more separate buildings.

Sec. 146. **Openings Inserted in Dividing Walls.**—If openings are to be inserted in dividing walls, as before described, or in dividing walls between non-fireproof and fireproof buildings or parts of buildings, they shall be made as follows:

They shall have doors placed on each side of each opening in such walls, which doors shall be made of No. 12 plate iron with a continuous 2 by 2 by $\frac{3}{8}$ inch angle iron frame extending all around the same and the plate riveted thereto with $\frac{1}{2}$-inch rivets, placed four inches between centers. If such doors are made double they must have cross bars, levers, and hooks so arranged that when the doors are closed they will be of strength equal to that of a single door. All doors must be hung on frames made of $\frac{3}{4}$ by 4 inch iron stiffened with an angle iron extending all around the same and fitting up snug to the wall. The frames must be fastened to each other by bolts extending through the wall, such bolts being not more than two feet apart, and such doors must swing on three hinges, and must be made to fit closely to the frame all round. The sills between the doors must be of brick, iron, stone or concrete, and must rise at least two inches above the floor on each side of each opening. The lintel over the door must be made of brick or iron, and the wall between the two door frames must be covered with a coat of plaster at least $\frac{1}{2}$ inch thick.

Sec. 147. **Elevator Buildings—Bins of.—Cupola and Enclosure Walls of. — Outside Openings Into. — Openings in Body of First Story and in Boiler Houses.** — Elevator buildings (which term shall be interpreted as including all buildings intended solely for the receipt, storage and delivery of grain in bulk) may be constructed with bin walls, both externally and internally, made entirely of wood; provided, such walls are made solid and without cellular open spaces within them. The external bin walls shall have a covering of brick or hollow tile not less than twelve inches thick, which shall be united to the bin walls by anchors, in the construction and arrangement of which due allowance is made for the variations of shrinkage of the enclosing wall and of the wooden bin wall. If the weight of the bins is independently carried on a skeleton construction of timber, steel or iron, the first-story walls shall be of brick, not less than twenty inches thick. If the outer walls of the outside bins and their facing are not carried on a skeleton construction, then the first-story wall shall not be less than twenty-eight inches thick, or as much thicker as may be required to keep the load upon the brickwork within the limits of stress elsewhere specified in this ordinance.

The cupola or enclosure walls of elevator buildings shall be made of hollow tile not less than six inches thick; anchor the framework as above specified.

The outside openings in elevator buildings shall have protections of wire netting made of No. 14 wire, with meshes not over $\frac{1}{2}$ by $\frac{1}{2}$ inch.

All openings in the body of first story elevator buildings, and the openings in the engine and boiler houses of the same, and between these and the main building, shall have iron doors.

Sec. 148. **Thickness of Walls of Classes II and III.—Exception to Above.** — Buildings of Classes II and III shall conform to the following requirements:

The thickness of enclosing walls of buildings of this class shall be made in accordance with the following table, to-wit:

	Basement.	STORIES.										
		1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.
Basement and	12	8	....	....	....	....	....	....	....	....	....	....	....
Two-story	12	12	8	....	....	....	....	....	....	....	....	....	....
Three-story	16	12	12	8	....	....	....	..	....	....	....	....	....
Four-story	20	16	16	12	12	....	....	....	....	....	....	....	....
Five-story	20	16	16	16	12	12	....	....	....	....	....	....	....
Six-story	20	20	16	16	16	12	12	....	....	....	....	..	....
Seven-story	24	24	20	20	16	16	12	12	....	....	....	....	....
Eight-story	24	24	24	20	20	16	16	12	12	....	....	....	....
Nine-story	28	24	24	20	20	20	16	16	12	12	..	....	....
Ten-story	28	24	24	24	20	20	20	16	16	12	12	....	..
Eleven-story	28	28	24	24	24	20	20	20	16	16	12	12	.
Twelve-story	32	28	28	24	24	24	20	20	20	16	16	12	12

Three-story apartment houses or flats shall have the third story wall 12 inches in thickness instead of 8 inches as above.

Sec. 149. **Supports for Joists.** — If in buildings of Class II the distance between the enclosing walls is more than twenty-four feet in the clear, there shall be intermediate supports for the joists, which supports shall be either brick walls or iron or steel columns and beams. If brick walls are used for this purpose they may, in all cases where the thickness of walls is given in the table as sixteen inches or more, be made four inches less in thickness than the dimensions stated in the table.

Sec. 150. **Division Walls and Partitions in Apartment Houses, Boarding or Lodging Houses and Hotels.**—In all apartment houses, the dividing walls or partitions between

the apartments provided for each family shall be made entirely of incombustible material. In boarding houses, lodging houses, or hotels, sixty feet or less in height, there shall be for every eight rooms in any one story, dividing walls or partitions of incombustible material or of stud partitions filled the full thickness and height with mineral wool, or substance equally as good, and plastered on metal lath, separating these eight rooms from the contiguous spaces.

Sec. 151. **Fire Stop in Hotels, Lodging Houses and Boarding Houses.** — In hotels or lodging houses or boarding houses, 90 feet or less in height, there shall be a fire stop of brick, concrete or tile, between the ceiling and floor in each floor of joists for each twenty-five feet or fractional part thereof measured in the direction of the length of joists.

Sec. 152. **Stairs in Class II. — Office Buildings — Meaning of.—Stairs in.**—Stairs in buildings of Class II shall be adapted, in number and width, to the area, height, and to the uses to be made of the building in which they occur.

For office buildings, by which shall be understood buildings divided into apartments intended for business uses only, and in which there shall be no sleeping apartments whatever, there shall be in buildings of ordinary construction and of less ground area than 2,000 square feet, one flight of stairs not less than five feet wide, or two flights not less than three feet wide each; and for office buildings of ordinary construction and of greater ground area than 2,000 square feet, there shall be an additional flight of stairs for each additional 2,000 square feet of ground area, or for any fractional part thereof. For office buildings of slow-burning or mill construction there shall be at least one flight of stairs not less than five feet wide or two flights not less than three feet wide for the first 3,000 square feet of ground area, and an additional flight of stairs shall be required for each additional 3,000 square feet of ground area or fractional part thereof. For fireproof office buildings there will be required one flight of stairs not less than five feet wide for the first 5,000 square feet of ground area, and an additional flight for each additional 5,000 square feet of ground area or fractional part thereof.

Sec. 153. **Stairs in All Other Buildings of Class II.**—For all other buildings of Class II, there will be required for each building at least two flights of stairs which, for buildings of 2,000 square feet or less in ground area, shall be at least three feet wide each with an increase of six inches in width for each additional 500 square feet to the ground area of the building up to a ground area of 3,000 square feet, and after that there shall be an additional flight of stairs not less than three feet wide for each additional 2,000 square feet of floor area or fractional part thereof. In all cases where buildings of Class II are built entirely of fireproof construction, the number of stairs herein provided may be reduced by one flight from the number herein specified for non-fireproof buildings.

Sec. 154. **Rooms of Class II When Considered Habitable.** — In buildings of Class II and III no room shall be considered habitable or used as a habitation unless it has at least one window of an area equal to one-tenth of the superficial area of such room, opening into the external air.

Sec. 155. **Means of Communication with Outer Air of Buildings.**—No space of less area than thirty-six square feet for each three-story building, or less area than forty-eight square feet for a fourstory building, and so on, increasing ten square feet for each additional story in height, shall be considered as affording means of communication with the outer air, and such open spaces or light shafts, if covered with a skylight or roof of any kind, shall not be considered as fulfilling the terms of this ordinance. This space must be left on land owned by owner of building in question.

Sec. 156. **Strength of Floors of Class I.**—No building of Class I shall be built with a strength of floor construction in any part thereof less than sufficient to carry, within the limits of stress for the different materials elsewhere herein specified, a load of 100 pounds for each square foot of floor surface; and the strength of such building shall be increased above the capacity to carry 100 pounds per square foot of floor surface, if the uses to which such building or part thereof is to be applied involve greater stress.

Sec. 157. **Display of Placard Indicating Strength of Floors.** — It shall be the duty of the owner of every building of Class I, already constructed, or hereafter to be constructed, or of his agent, or of the occupant of the same, to affix and display conspicuously on each floor of such building, a placard stating the load per square foot of floor surface which may with safety be applied to that particular floor, or if the strength of different parts of any floor varies, then there shall be such placards for each varying part of such floor. It shall be unlawful to load any such floors or any part thereof to a greater extent than the load indicated upon such placards. It shall be the duty of occupants of buildings to maintain such placards during their occupation of the premises, and the owners of buildings, or their agents, to cause the same to be properly affixed with each change of occupation. It shall be part of the duty of architects of all buildings to calculate the figures for such placard, which are to be verified and approved by the Commissioner of Buildings before they are affixed upon the respective floors of the different buildings.

Sec. 158. **Allowance for Live Load in Constructing Floors of Classes II and III. — Determining Strength of Posts and Area of Foundation of Classes II and III.** — For buildings of Classes II and III, except office buildings, including frame buildings outside of the fire limits, the floor shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of 40 pounds for every square foot of surface in such floors. For office buildings and for all buildings of Classes IV and V the live load above referred to shall be 100 pounds per square foot.

In determining the area of foundation for many-storied buildings in buildings of Classes II and III, allowances are to be made for the fact that the before mentioned live load is but an occasional load, which rarely occurs simultaneously upon corresponding parts of many floors, and if so, for a very brief period only.

Sec. 159. **Strength of Roofs.**—The roofs of all buildings of every kind and class, including frame buildings outside of fire limits, shall be designed and constructed in such manner that they will bear a load in addition to their structure and covering of at least twenty-five pounds for each square foot of horizontal surface.

Sec. 160. **Ordinance - Not Considered as Requiring Alteration of Building.—Altering Building to Make Conform to Ordinance.** – Excepting in cases where the immediate safety of the occupants of buildings is concerned, nothing in this ordinance shall be considered as requiring alterations in the construction or equipment of buildings existing at the time of the passage of this ordinance and at that time complying with the ordinance at that time in force. If, however, it is desired to enlarge, or in any manner materially modify the construction of any existing buildings, or to make change in its use or occupation which will transfer it from one class as recognized by this ordinance to another, then before such enlargement or structural change or modification of building is made, or before such change in its use or occupation may be made, the entire building shall be reconstructed or modified in such manner as to bring the same when enlarged or altered, or when occupied for its new and different purposes, in accordance with the provisions of this ordinance.

Sec. 161. **Increasing Thickness of Walls of Altered Building.**—If the walls of such building are not of sufficient thickness to comply with the requirements of this ordinance for the enlarged or modified building, then the thickness of the existing walls shall be increased by building alongside of them a new wall, which shall not, however, be less in any part thereof than 12 inches thick, and which shall be increased in thickness by four inches for at least every forty feet in the height of such wall. Such new wall must be laid in cement mortar and must be anchored to the old wall (bonding with brick or masonry will not be considered as complying with this ordinance); and if an increase in the height of the building is contemplated, the wall from the top of the old wall shall be built jointly upon the new and old walls. If solid masonry buttresses are introduced in connection with such thickening and strengthening of existing walls, the intervening wall may be reduced to eight inches in thickness, provided such buttresses are sufficient in number and in area to make the resultant structure of equal strength with the solid wall already specified.

Sec. 162. **Party Walls.** The foregoing shall also apply to all cases where existing party walls are to be joined to for the erection of new buildings. But in the case of party walls which at the time of their erection were built in accordance with the terms of the building ordinance then in force, such walls, if sound and in good condition, may be used without increase of thickness for any building not higher than and of the same class as the building for which the original wall was built.

Sec. 163. **Foundation of New and Old Walls.** — In all cases where there is such increase of walls, a new foundation shall be built in such manner as to carry jointly both the new and old walls, and the soil under such foundations shall not be loaded beyond the limits elsewhere herein specified.

Sec. 164. **Class IV – Definition of.—Class V – Definition of.—Outside Walls of Classes IV and V.**—Buildings of Class IV embrace all buildings in which no movable scenery is used upon the stage thereof.

Class V embraces all buildings in which movable scenery is used.

The outside walls of all buildings of Classes IV and V, the roofs or ceilings of which are carried on trusses or girders of a span of fifty feet or more, shall have walls as follows:

If the walls are less than 25 feet high, not less than 20 inches thick.

If more than 25 feet and less than 45 feet high, the walls shall not be less than 24 inches thick.

If more than 45 feet and less than 60 feet high, the walls shall not be less than 28 inches thick.

If the walls are over 60 feet and less than 75 feet high, they shall not be less than 32 inches thick.

If more than 75 feet and less than 90 feet high, the walls shall not be less than 36 inches thick.

An increase of four inches in thickness of walls shall be made in all cases where walls are over 100 feet long without cross walls of equal height.

For rooms less than fifty feet wide, the thickness of walls before given may be reduced by four inches.

Sec. 165. **Structure Built Above Classes IV and V—Walls of.**—In case there should be one or more stories built above the room devoted to the uses of Classes IV and V, such stories being carried on trusses or girders, the thickness of walls shall be increased by four inches for each two stories or part thereof above every such room.

If solid masonry buttresses are employed, and placed sixteen feet or less apart, and extended to the foot of the trusses or girders carrying the ceiling, or if iron or steel pillars are inserted in such walls for the support of the superstructure, and at distances not more than eighteen feet between centers, such pillars extending to and carrying the superimposed trusses and girders, the thickness of such walls may be reduced in proportion to the increase of strength afforded by such buttresses or pillars, but in no case shall any such wall be less than twelve inches thick in the top story, four inches being added going downward, for each story, or for each gallery, or for each twenty-five feet in height of blank wall.

Sec. 166. **Pillars in Walls.**—If iron or steel pillars are introduced in said walls the brickwork around the same shall be bonded into that of the connecting walls, and each of such pillars shall have no less than eight inches of brick wall around it, the brick being measured from the extreme outer dimensions of such iron or steel pillars.

Sec. 167. **Frontage of Class IV Seating Less than 800.**—Buildings of Class IV, with seats for 800 persons or less, shall have a frontage upon two public spaces, of which at least one shall be a street, and of which the other, if it is not a street, shall be a public or private alley, not less than ten feet wide.

Sec. 168. **Frontage of Class IV—Seating Over 800.**—Buildings of Class IV of greater seating capacity than 800, and all buildings of Class V, shall face upon three open spaces, of which at least one shall be a public street, while the two others, if not streets, must be public or private alleys of a width of not less than ten feet each.

Sec 169. **Class IV, Construction of.**—Buildings of Class IV, containing not more than 600 seats, may be built of ordinary construction. If they contain more than 600 and less than 1,500 seats, they shall be built of slow burning or of mill construction. If they contain more than 1,500 seats, they shall be built of entirely fireproof construction.

Sec. 170. **Class V—Construction of.**—Buildings of Class V, containing less than 1,000 seats, shall be of slow-burning construction or of mill construction, and if they contain 1,000 or more seats, they shall be built entirely of fireproof construction.

Sec. 171. **Classes I, II or III—Built in Conjunction with Classes IV or V.** — If buildings of Classes IV or V are built in conjunction with or as part of buildings devoted to the uses of Classes I, II or III, then such buildings of Classes I, II or III shall be built of fireproof construction, if the connected building of Class IV contains more than 1,500 seats, or if the connected building of Class V contains more than 1,000 seats.

Sec. 172. **Any Building Constructed with Classes IV or V.** — Any building higher than sixty feet and connected with or made part of any building of Classes IV or V shall be entirely of fireproof construction. Any building less than sixty feet in height and made part of any structure of Classes IV and V shall, if its case is not already covered by other provisions of this ordinance, be made of slow burning or mill construction.

Sec. 173. **Openings Between Now Fireproof Building and Classes IV or V.** — In all cases where fireproof construction is not used for the whole of such connected buildings, there shall be at each connecting opening double iron doors between such building of Class IV or V and the building connected therewith.

Sec. 174. **Spires, Cupolas and Domes Upon Houses of Worship and Instruction.** — Spires, cupolas or domes or non-fireproof material may be erected as part of any house of public worship or instruction, if the same is used for these purposes only, and if such house of public worship or instruction is so built that it is nowhere nearer than twenty feet to any line of the lot upon which it stands, street and alley lines excepted, and such non-fireproof spires or domes may be maintained only while this intervening space of twenty feet is made and maintained as part of the grounds of the owners of such house of public worship or instruction. In case the above is complied with, such spire or dome may be built with a framework of combustible material which shall, however, be covered on the outside with porous terra cotta, hollow tile or mortar, and upon this, with a weatherproof covering of sheet metal, slate or glazed tile, the same as elsewhere specified for roofs of the same type of construction.

Sec. 175. **If Conditions Violated, Spire, Cupola or Dome Must be Taken Down. — Roofs of Isolated Buildings of Class IV.**—If the twenty feet of vacant ground, before mentioned, as one of the conditions upon which the building of spires and domes having a

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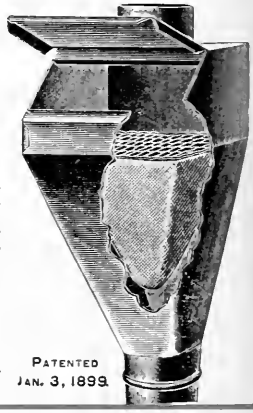

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combustible framework is permitted, should be built upon, then such spire or dome shall be taken down.

The roofs of isolated buildings of Class IV shall be constructed in the same manner as that provided for spires, domes and cupolas.

Sec. 176. **Limitations of Floor Levels of Classes IV and V.—Floor Level of Auditorium of Class V.-Exception to Above.**—The following limitations of floor levels in buildings of Classes IV and V shall be observed in all cases of new construction or reconstruction or alteration or improvement of existing buildings:

The floor level of the auditorium of the buildings of Class V shall be maintained within the limits of the first-story thereof, and in all cases where such floors are banked or stepped up, the floor of the lowest banks shall not be above the sidewalk level. If the floor of the first story is level it shall not be higher than three feet above the sidewalk level.

The only exception to the foregoing shall be the case of rooms of Classes IV and V, containing less than 500 seats, which, in fireproof buildings, may be located in any story thereof, but in such case there shall be at least two flights of stairs from the floor in which such auditorium of Class V is located to the ground, and the width of such stairs shall not be less than four feet in the clear for each.

Sec. 177. **Auditorium Floor of Class IV—Height Above Sidewalk.**—In buildings of Class IV no auditorium containing more than 1,000 seats shall have the highest part of its main floor at a greater distance than eight feet above the adjacent sidewalk grades. No room of Class IV containing more than 500 seats shall be at a greater distance from the sidewalk grade than thirty feet. No room of Class IV containing more than 200 seats shall be at a higher level above the sidewalk grade than forty-five feet.

Sec. 178. **Classes IV and V—Stairs of—Stairways of—Entrances and Exits of.**—Stairs in buildings of Classes IV and V shall be in width equivalent to eighteen inches for every 100 seats in such building—fractional parts of 100 being in each case counted as a full 100 seats—but no stairway in such building shall be less than four feet wide in the clear. All stairways shall have railings on each side thereof. No stairways shall ascend a greater height than eleven feet without a level landing, which, if its width is in the direction of the run of the stairs, shall not be less than three feet wide, or which, if at a turn of the stairs, shall not be of less width than that of the stairs.

Distinct and separate places of exit and entrance shall be provided for each gallery above the first. A common place of exit and entrance may serve for the main floor of the auditorium and the first gallery, provided its capacity be equal to the aggregate capacity of the outlets from the main floor and the said gallery.

Sec. 179. **Classes IV and V—Aisles of.—Steps in Aisles of.—Aisles and Passageways of—Kept Unobstructed.—Widths of Corridors—Passages—Hallways and Doors of.**—Aisles in buildings of Classes IV and V shall be in width equal to eighteen inches for every 100 seats or fractional part thereof, and the occupants of which will be required to use such aisles, but no aisle is to be less than two feet three inches wide in its narrowest part.

Steps shall be permitted in aisles only as extending from bank to bank of seats, and wherever the rise from bank to bank of seats is less than six inches the floor of the aisle shall be made as an inclined plane, and where steps occur in outside aisles or corridors, they shall not be isolated, but shall be grouped together, and there shall be a lamp at or near every place where there are steps in enclosing aisles or corridors.

All aisles and passageways in said buildings shall be kept free from camp stools, chairs, sofas and other obstruction, and no person shall be allowed to stand in or occupy any of said aisles or passageways during any performance, service, exhibition, lecture, concert, ball, or any public assemblage, nor shall there be any chair, settees or camp stools in such aisles or corridors at such times or occasions.

The width of corridors, passages, hallways and doors shall be computed in the same manner as that herein provided for stairways and aisles, excepting, however, that no corridor shall be anywhere less than five feet in width, and no door less than three feet wide.

Sec. 180. **Classes IV and V—Emergency Exits of.**—Emergency exits and stairways shall be provided outside of the walls of all buildings of Class IV seating more than 1,500 persons, and all buildings of Class V seating more than 800 persons. The aggregate width of such emergency exits, which shall be provided for each floor, balcony and gallery of such building, shall be one-half of that provided for the main exits, and no emergency exit, door or stairway shall be less than three feet in width. The framework of these stairs shall be made of iron, the treads of wood. These emergency exits are to be kept free of obstructions of all kinds, including snow.

Sec. 181. **Classes IV and V—Doors of, Open Outward—Walls Between Auditorium and Stage of.**—All doors in buildings of Classes IV and V shall open outward.

In buildings of Classes IV and V there shall be a solid brick wall, of the same thickness as that called for on the outside walls, between the auditorium and stage: and in non-fireproof buildings this wall shall extend to a height of six feet above the roof.

The main curtain opening shall have an iron or asbestos curtain, and all other openings in this wall shall have iron doors.

Sec. 182. **Construction of Stage.**—The framing of the floor of every stage upon which movable scenery is to be used shall be of iron or steel. The stage floor may be of wood, but shall not be less than three and three-fourths inches thick. The entire floor construction and floor of fly-galleries and rigging lofts, and all railings and supports and stanchions thereon, as also all sheaves and pulleys and their supports, shall be of iron or steel. All woodwork, including the under side of floor boards, and also all scenery used on or about the stage, shall be coated with a fireproof paint, the qualities of which shall be submitted and approved by the Commissioner of Buildings in the manner hereinbefore provided for building materials generally. All wood used for floors and floor support in buildings of Classes IV and V shall be coated on the under side with the same kind of paint.

Sec. 183. **Structure Over Ceiling of Classes IV or V—Construction of.**—Structures of any kind, and for any purpose whatsoever, erected above the ceiling of any auditorium containing 500 or more seats, shall be entirely of fireproof construction, and shall not be larger in area than 70 per cent. of the area of said auditorium.

If any structure is built over the ceiling or roof of any building of Class IV or V, the different members of the girders or trusses supporting same shall have their fireproofing double, in the manner described for pillars or fireproof buildings of Class I.

Sec. 184. **Flue Pipe Over Stage of Class V.**—There shall be over the stage of every building of Class V a flue pipe of sheet metal construction, extending not less than fifteen (15) feet above the highest part of the roof over the stage of said building—flue shall have an area of at least one-thirtieth of the total area of the stage. The dampers for flue shall be made of metal and opened by a close-circuit battery; a switch to be placed in the ticket office and one placed near the electrician's station on the stage, each to have a sign with these words printed on it: "Move switch to left in case of fire to get smoke out of building."

Sec. 185. **Automatic Sprinklers in Class V.**—In every building of Class V a system of automatic sprinklers to be supplied with water from a tank located not less than 20 feet above the highest part of roof of building. Sprinklers shall be placed above and below the stage; also in paint room, store room, property room and dressing rooms, if they are in or connected with Class V building, and not separated by approved double iron doors. Tank not to be connected to standpipe and ladder system, but to have separate pipe for filling from fire pump, and a 3-inch iron pipe extending from tank to outside of building, with siamese connections for fire department use. The entire sprinkler equipment to be approved by the Commissioner of Buildings, Fire Marshal and the Board of Underwriters of Chicago.

Sec. 186. **Diagram of Exits Printed on Programmes.**—It shall be the duty of the owner, lessee or manager of every building of Classes IV and V, during the performances of which programmes are issued, to cause a diagram showing the exits of such building to be printed on such programmes.

Sec. 187. **Sign Over Exits of Classes IV and V.**—All exits opening in buildings of Classes IV and V shall have the word "Exit," in letters at least six inches high, applied to the auditorium side and to the stage side of every exit.

Sec. 188. **Fire Apparatus on Stage of Classes IV and V.**—In buildings of Class V, and also Class IV, where stationary scenery is used, there shall always be kept for use portable fire extinguishers or hand fire pumps, on and under the stage; in fly-gallery and in rigging loft, also at least four (4) fire department axes, two (2) twenty-five-foot hooks, two (2) fifteen-foot hooks, two (2) ten-foot hooks, on each tier or floor of the stage, all subject to the approval of the Fire Marshal.

Sec. 189. **Fire Alarm Telegraph Apparatus.**—Such buildings shall also be provided with a fire alarm telegraph apparatus, connected by the necessary wires with the headquarters of the city fire alarm telegraph, or such other place or places as the Fire Marshal shall direct.

Sec. 190. **Employment of Firemen in Class V.**—It shall be the duty of the owner, agent, lessee or occupant of any building of Class V, with accommodations for 1,000 or more persons, to employ one or more competent, experienced firemen, approved by the Fire Marshal, to be on duty at such theater during the whole time it is open to the public; such firemen shall report to and be subject to the orders of the Fire Marshal, and shall be in uniform and shall see that all fire apparatus required is in its proper place and in efficient and ready working order.

Sec. 191. **License of Classes IV and V.**—The license for each building of Class IV and V shall state the number of persons it has accommodations for, and no more than that number shall be allowed to enter such hall at any one time, which number shall be governed by the number of feet of exit, of the doors and passages, and shall be approved by the Commissioner of Buildings.

Sec. 192 **All Parts of Classes IV and V Well Lighted During Performance.** — Every portion of any building of Classes IV and V devoted to the uses or accommodation of the public, also all outlets leading to the streets, and including the open courts and corridors, stairways and exits, shall be well and properly lighted during every performance, and the same shall remain lighted until the entire audience has left the premises.

Sec. 193. **Control of Lights in Halls, Corridors and Lobbies.—Connection with Gas Main.—Protection of Suspended and Bracket Lights.—Protection of Lights Inserted in Walls.—Protection of Footlights.—Construction of Border Lights.—Ducts and Shafts Conducting Heated Air from Lights.—Protection of Stage Lights.**—For buildings of Class IV.—All gas or electric lights in the halls, corridors, lobby or any other part of said building used by the audience, except the auditorium, must be controlled by a separate shut-off, located in the lobby, and controlled only in that particular place. Gas mains supplying the building shall have independent connections for the auditorium and the stage, and provision shall be made for shutting off the gas from the outside of the building. All suspended or bracket lights surrounded by glass, in the auditorium, or in any part of the buildings, shall be provided with proper wire netting underneath. No gas or electric light shall be inserted in the walls, woodwork, ceiling, or in any part of the building, unless protected by fireproof materials in all buildings of Classes IV and V. The footlights, in addition to the wire network, shall be protected by a strong wire guard, not less than two feet distant from said footlights, and the trough containing said footlights shall be formed of and surrounded by fireproof materials. All border lights shall be constructed according to the best known methods, and subject to the approval of the Commissioner of Buildings and the Fire Marshal, and shall be suspended for ten (10) feet by wire rope. All ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal, and made double, with an air space between them. All stage lights, if gas, shall have strong metal wire guards or screens, not less than ten (10) inches in diameter, so constructed that any material in contact therewith shall be out of reach of the flames of stage lights, and must be soldered to the fixtures in all cases.

Sec. 194 **Under Control of Fire Department and Commissioners.**—The standpipes, gas pipes, electric wires, hose, footlights and all apparatus for the extinguishing of fire, or guarding against the same, as in this section specified, shall be at all times made and kept in condition satisfactory to and under the control of the Fire Department, the Commissioner of Buildings and the Fire Marshal of the City of Chicago.

Sec. 195. **Commissioner and Fire Marshal Empowered to Enter Classes IV and V.** The Commissioner of Buildings or Fire Marshal, or their respective assistants, shall have the right to enter any building of Classes IV and V, and any and all parts thereof, at any reasonable time, especially when occupied by the public, in order to properly judge of and discharge their respective duties; and it shall be unlawful for any person to refuse admission to such officers or to throw obstacles in the way of such officers while engaged in the performance of their duties.

Sec. 196. **Commissioner or Fire Marshal May Order Closed Classes IV or V.**—The Commissioner of Buildings or Fire Marshal shall have the power to order any building of Classes IV and V to be closed, where it is discovered that there is any violation of the provisions of this ordinance, until the same are complied with.

Sec. 197. **Mayor May Revoke License of Classes IV and V.** — Upon the report to the Mayor by the Department of Buildings, or of the Fire Marshal, that any order or requirement of this ordinance, in regard to Buildings of Classes IV and V, has been violated or not complied with, in any such building, the said Mayor shall revoke the license of such theater or place of public amusement, and cause the same to be closed.

Sec. 198. **Movable Awning—Erection of.**—All movable awnings hereafter erected shall be elevated at least eight feet at the lowest part thereto above the top of the sidewalk, and shall not project over the sidewalk to exceed three quarters of the width thereof. They shall be supported without posts, by iron brackets, or by an iron framework attached firmly to the building, so as to leave the sidewalk wholly unobstructed thereby. In all buildings of Classes I, II, IV and V the windows above the second story shall be so constructed as to permit the cleaning of them from the interior of the building, unless suitable stationary platforms, balconies or porches admit safe access to the outside of such windows.

Sec. 199. **Fixed Awnings—Erection of.—Width and Height of.**—Fixed awnings may be constructed over sidewalks as protection to the entrances of buildings, provided that such awnings are constructed of metal framework, filled with glass not less than three-fourths inch thick, and supported entirely from the structure of the building, and without posts or other obstructions upon the sidewalk.

Such awnings shall be of the width of the entrance which they protect, and shall extend over the entire width of the sidewalk in front of the same. The lowest part of such awnings shall be at least 12 feet above the sidewalk level.

Awnings projecting not over four (4) feet from building line may be ten (10) feet above the sidewalk at their lowest point.

Sec. 200. **Hatch Closers, in Elevator Shafts of Class I.—Commissioner and Fire Marshal to Examine.**—Wherever elevators in non fireproof buildings or in fireproof buildings of Class I are built without enclosing walls, there shall be at every floor through which they pass automatic hatch closers or automatic doors made in such manner that they will fully close each well hole when the temperature in such well hole exceeds 140 degrees Fahrenheit.

Before any doors shall be considered as fulfilling the purposes of this ordinance, they shall be examined by the Commissioner of Buildings and the Fire Marshal, and if it is found by these officials that such doors will automatically close when the temperature at or near the same exceeds 140 degrees Fahrenheit, and that also the conditions of construction and operation of such doors or hatch closers are such that there is no reasonable probability of their getting out of order and failing to operate when required, and if there is nothing in their application or operation that is likely to cause accidents to, or interfere with, the elevator service in the hatch holes which they are intended to close, then, and in such case only, shall the use of such hatch closers or doors be permitted.

Sec. 201. **Elevator Well, when Enclosed—Walls of.**—If such hatch holes are not supplied with hatch closers or doors, as before described, the elevator well shall be enclosed in all non-fireproof buildings with an entirely self-supporting wall of brick or tile extending from the foundation to a height of six feet above the roof of the building in which such elevator occurs, and in buildings of fireproof construction the walls or partitions enclosing such elevator shafts, which may be of light construction, but which must be incombustible, may be carried from story to story upon the construction of the same.

Sec. 202. **Elevator Shafts—Doors of.**—All elevator shafts and all elevator enclosures of every kind shall have iron doors which shall be made to open from the inside only, excepting only the door upon the ground floor of the building, which shall also have a lock to permit opening the same from the outside.

Sec. 203. **Elevator Shaft—Roof of.**—The roof of each elevator shaft shall be formed by a skylight, and to have ventilator at least 1-20 the area of the shaft. Skylights and ventilators may be omitted where there are windows in shafts opening on streets, alleys or courts.

Sec. 204. **Scaffolds — Erection of. — Floors During Building Operations. — Fine for Violation of Ordinance.— Commissioner May Revoke Building Permit—Architect Liable to Penalty.**—All scaffolds erected in this city for use in the erection, repair, alteration or removal of buildings, shall be well and safely supported, and of sufficient width, and properly secured, so as to insure the safety of persons working thereon, or passing under, or by the same, to prevent the falling thereof, or of any materials that may be used, placed or deposited thereon. It shall be the duty of all owners, contractors and builders, and all persons who shall have the supervision or control of the construction or remodeling of any building more than thirty feet high, to put in and lay upon the upper side of the joists or girders of each story in any building as soon as the joists or girders are laid, a good and substantial temporary or permanent floor for the protection of employes and all persons engaged in or upon the construction of said building, wherein no unprotected opening shall be left; and it shall be unlawful to place or put up the joists or girders of another story until each lower floor is thus laid. And it shall be the duty of all owners, contractors, builders or persons having the control or supervision of all buildings which shall be more than thirty feet high to see that all stairways, elevator openings, flues and all other openings in the floors shall be covered or properly protected.

Any person or persons violating the provisions of this ordinance shall be each fined in a sum not less than one hundred dollars nor more than two hundred dollars per day; and any permit granted for the construction of said building by the authorities of the City of Chicago may be revoked in the discretion of the Commissioner of Buildings of the City of Chicago. Any architect having charge of such building, who shall permit it to be constructed in violation of this ordinance, shall be liable to the penalties provided and imposed by this ordinance.

Sec. 205. **Walls—Erection of—Walls and Skeleton Framework Securely Braced — Foundations Protected.**—In the erection of buildings of masonry construction, no wall shall be carried up at any time more than two stories above another wall of the same building. The walls and skeleton framework of all buildings must be kept securely braced and otherwise protected against the effects of the weather during all building operations. All foundations must be protected against the effects of frost, and frozen cement mortar shall not be used in connection with building operations.

Sec 206. **Signs on Buildings.**—All signs placed on any building above the level of the second story of the same shall be made of incombustible material. Wooden signs shall not be made of greater width than two feet.

Sec 207. **Fences Height of.**—No wood fence shall be constructed of greater height than eight feet above the sidewalk grade, or eight feet above the surface of the ground, where no grade is established.

Sec. 208. **Storage of Lumber.**—No lumber shall be piled for the purpose of storage, seasoning or drying the same, within fifty feet of any planing mill or woodworking manufactory, nor within 100 feet of any private residence, unless the same has been erected since the establishment of such yard.

Sec. 209. **Classes I, II, III and IV—Fire Escapes and Standpipes On.—Class V—Fire Escape and Standpipe On.** - All buildings, Classes I, II, III IV, of four or more stories in height, in the City of Chicago, shall be provided and equipped with one or more metallic standpipes and ladders combined, with cast-iron, wrought-iron or steel balconies, with suitable railings at each floor, and firmly secured to the outer walls, and in such locations and numbers as shall be satisfactory to the Commissioner of Buildings, the Fire Marshal and the Fire-Escape Inspector.

All buildings of Class V, with accommodations for 1,000 or more persons, shall have at least one three-inch iron standpipe and metallic ladder combined in the street or alley, on the outside of the building, from ground to roof, with hose attachments, close to a window or door at each floor or gallery.

All such fire escapes shall be put up and completed to conform to the buildings for which they are respectively intended and shall be inspected after completion, and if found in a perfectly safe and satisfactory condition, a certificate shall be issued by the Commissioner of Buildings to that effect upon payment of $1.

Sec. 210. **Anchors. — Balconies. — Ladders. — Standpipe. — Siamese. — Anchors for the Top of Standpipe. — Painting.** — All single and double fire escapes, with ladders, hereafter erected, shall be in strict accordance with the following specifications:

There shall be no less than three 1-inch square or 1-inch diameter round wrought-iron anchors to every six-foot balcony, and six for a twelve-foot balcony. Said anchors must pass through the wall of building and bolt on the inside with a ¾ x 2-inch nut and 3½-inch cast-iron washer back of nut, where the wall is not over twenty inches thick; but where wall is over twenty inches thick, anchors shall be inserted at least eight inches into the wall on an angle of thirty-five degrees.

The brace of anchors must at least be twenty inches spread, and pass into the wall four inches at bottom. No other anchors allowed without a special permit from the Commissioner of Buildings.

All balconies hereinafter erected must be either heavy cast-iron, iceproof, capable of sustaining a weight of 500 pounds to the square foot, or a steel balcony, as hereinafter described, capable of sustaining the same weight per square foot. The balcony frame will be made of not less than 1½ x 3 angle iron, securely riveted together, with cross-bars every two feet, said bars to be punched one-half inch square every two inch, center, and ½-inch square iron forced through the same, leaving a manhole of not less than 24 x 24 inches. The cross-bars to be securely riveted to the angle-iron frame. The cross-bars for a balcony twenty-eight inches wide to be 1½ x ⅜ inch iron. Balcony frames over twenty-eight inches wide will be made of not less than 2 x ⅜-inch iron, to conform with the increased dimensions of iron in cross-bars; for thirty-inch balcony, 2 x ⅜-inch; for thirty-six inch balcony or over, 2½ x ⅜-inch. All balconies over this width must have a 2-inch "T" iron through the center of balcony for the bars to rest upon. Said balconies to have a substantial cast or wrought-iron post every three feet, bolted to the balcony. No balcony will have less than two guard rails, same to be of wrought-iron, or new pipe not less than three-fourths inches in diameter, and the ends to be anchored in the wall of building not less than ten inches on an angle of thirty-five degrees.

The ladder, where used in combination with the standpipe, must be bolted to said stand-pipe with short-topped bolts every four feet, and bolted to the balconies. Rungs of ladder to be ½-inch square iron, with the corners upward, so as to give a safe footing. Every other rung to be riveted and to be 14-inch centers. Where ladder is put up without a standpipe, the side guards must be 2 by ⅜-inch flat iron or 1¼-inch pipe. All ladders must be 17 inches or more between pipes. No secondhand pipe will be allowed to be used and will be condemned if found in this construction by the inspector.

The standpipe will be of the best 3-inch wrought iron, 7½ pounds to the foot, and a 2½-inch brass hose valve, of the city standard thread, will be attached to the standpipe at every outlet at each floor and on the roof. Inside of all buildings over 100 feet in height, there shall be one 4-inch standpipe, extending from pump to roof, also connection on first floor with two-way siamese connection for Fire Department and check valve against pump; two hose connections on each floor and roof, with Fire Department thread and enough hose attached to reach any point of the floor.

There will be a two-way automatic siamese at the bottom of the standpipe, so that two steam fire engines can be attached to it without interfering with each other. Said siamese must be within easy reaching distance from the sidewalk and to be securely anchored to the wall of the building.

All the anchors for the top of standpipe and ladders must pass through the wall and bolt on the inside of same.

All work must be painted with two coats of the best mineral paint, and all holes must be filled up with the best cement.

That no such fire escape shall be constructed except upon a permit therefor, issued by the said Commissioner of Buildings upon the payment by applicant therefor to the City Collector of a permit fee of $2.

Sec. 211. **Location of Buildings for Storage of Petroleum, Etc.—Walls of—Floors of—Roofs of.**—Buildings designed for the storage of petroleum or articles of like nature shall not be less than 100 feet from any other building, and be constructed as follows, to-wit:

Their walls shall not be less than sixteen inches thick, nor more than sixteen feet high; their floors shall be made of fireproof paving or concrete, upon the ground, which shall be at least five feet below the street grade; their roofs shall be of metal, to have fire walls eighteen inches high all around, not less than twelve inches thick; and have copings of incombustible material, and subject to the approval of the Fire Marshal of Chicago.

Sec. 212. **Storage of Petroleum, Gasoline, Etc., Within Limits of City.**—It shall be unlawful for any person, persons or corporation to store or keep for sale within the corporate limits of the City of Chicago, except in buildings constructed as provided for in the last preceding section, any crude petroleum, gasoline, naphtha, benzine, camphene, spirit gas, burning fluid or spirits of turpentine, exceeding a quantity of five barrels of fifty gallons each; and it shall be unlawful to keep for sale or on storage any refined carbon, oil, kerosene or other products, for illuminating purpose, of coal, rock or earth oils, excepting such refined oils as will stand a fire test of 150 degrees Fahrenheit, and according to the method and direction of John Tagilbue; and it shall not be lawful to keep any quantity of said articles exceeding one barrel of fifty gallons in any part of a building, excepting a cellar, the floor of which shall be five feet below the grade of the adjacent streets; and no crude petroleum, gasoline, naphtha, benzine, carbon oil, camphene, spirit gas, burning fluid or spirits of turpentine shall be kept or stored in front of any building, or on any street, alley, wharf, lot or sidewalk, for a longer time than is sufficient to receive in store or in delivering the same, provided such time shall not exceed six hours.

Sec. 212a. **Tank for Water.**—It shall be unlawful for any person to construct, have, or permit to remain in any building in the City of Chicago, any tank for water of a larger capacity than 400 gallons, unless the said tank shall rest upon a foundation of solid brick or stone masonry, or upon iron girders, which rest upon solid brick or stone masonry, or upon iron construction; provided, no such tank shall be constructed without first obtaining therefor a permit from the Commissioner of Buildings, which permit shall cost $2.

Sec. 213. **Buildings in Public Parks.**—Buildings in public parks shall be subject to the provisions of this ordinance.

Sec. 214. **Fire Limits of City.—Walls—Structures and Buildings Altered to Conform to Ordinance.**—The fire limits of the City of Chicago shall be as defined by existing ordinances.

No wall, structure, building or part thereof will hereafter be built, constructed, altered or repaired within the fire limits of the City of Chicago except in conformity with the provisions of this ordinance. No building already erected or hereafter to be built within said fire limits shall be raised, altered or built upon in such manner that, were said building wholly rebuilt or constructed after the passage of this ordinance, it would be in violation of any of its provisions.

Sec. 215. **Expense of Altering Buildings by the City Recoverable from Owner.**—Whenever, in the opinion of the Commissioner of Buildings, it shall be necessary to tear down, alter, repair or rebuild any building or portion of any building which is dangerous, defective or unsafe, or which is reported to the said Commissioner by the Commissioner of Health to be unfit for human occupancy, or which has been built in violation of any of the provisions of this ordinance, or of any ordinance regulating the construction of buildings hereafter to be passed, he shall cause such building or such portion thereof to be torn down, altered, repaired or rebuilt, or such work to be done thereon as he may deem necessary to render said building, or said portion thereof, safe, and the expense thereof shall be recoverable of the owner or owners of said building, in an action of assumpsit, with such other process as may be necessary to insure the collection of said expense.

Sec. 216. **Fines for Violation of Ordinance.**—Any person, firm, company or corporation who violates, disobeys, omits, neglects, or refuses to comply with, or who resists or opposes the execution of any of the provisions of this ordinance, shall be subject to a fine of not less than $25, nor more than $200; and every such person, firm, company or corporation shall be deemed guilty of a separate offense for every day such violation, disobedience, omission, neglect or refusal shall continue, and shall be subject to the penalty imposed by this section for each and every separate offense; and any builder or contractor who shall construct any building in violation of any of the provisions of this ordinance, and any architect designing or having charge of such building who shall permit it to be so constructed, shall be liable to the penalties provided and imposed by this section.

Sec. 217. **Municipal Code—Sections of Repealed.**—That sections of the Municipal Code of Chicago of 1881, numbered as follows: 612 to 620, both inclusive; 623 to 651, both inclusive; Sections 990 to 1140, both inclusive, except Section 1109; also an ordinance relating to building permits passed October 3, 1887, and all ordinances and parts of ordinances in conflict with the provisions of this ordinance, are hereby repealed.

Sec. 218. **Ordinance in Force After Passage.**—This Ordinance shall be in force from and after its passage.

Sec. 219. At the expiration of thirty days after the printing and publication of said building ordinances, each and every person, agent, firm, company or corporation engaged within the limits of City of Chicago in the construction or repairing of the whole or any part of buildings and appurtenances, shall be and he or it is hereby required to obtain a license from the City of Chicago, which shall permit him or it to engage thereafter in the business of contracting for the erection of buildings and appurtenances or parts thereof.

Every application for such license shall be made on printed blanks furnished by the city, and shall set forth the name and residence or place of business of the applicant, and the nature of the contracts which he or it desires to engage in for a period of one year thereafter, and shall be accompanied by a fee of $2.

The city shall thereupon issue a license in due form, permitting the applicant to engage in the business of contracting for the erection of buildings and appurtenances, or parts thereof, in the City of Chicago, for one year from the date of such license, which date shall be the first day of May in the year in which such license is applied for, and no license shall be granted for any period less than a year, and all licenses shall run from the first day of May in each year until the 30th day of April in the succeeding year. The applicant shall also receive, free of charge, with his license, a copy of said compilation of the building ordinances and all building ordinances which may be passed after the publication of said compilation.

Nothing herein contained shall be construed as to make any change in the proper fees as now prescribed in the city ordinances to be paid to the City of Chicago for every 25 feet of street frontage so used.

Any person, agent, firm, company or corporation who shall, after the date fixed, as aforesaid, for the issuance of licenses, engage in the business of building in the City of Chicago, under contracts for the whole or any part of buildings and appurtenances without first having obtained a license therefor, as aforesaid, shall be deemed guilty of a misdemeanor for each day's violation of the provisions of this ordinance, and shall be subject to a fine for each offense of not less than $25 nor more than $100.

All fees and fines collected under the provisions of this ordinance shall be set aside and constitute a fund to defray the expense of the compilation and publication of the building ordinances of the city, as aforesaid, and from time to time, as may be required, and any surplus shall from time to time be paid into the general fund.

AMENDMENTS.

The following Amendments should be read with Sections 48, 49, 67, 148, 198, 210, 212, 219.

June 20, 1898. Sec. 49 was amended by inserting the words 'avenue or alley' after the words "or any street" (in second line).

Sept. 12, 1898. Sec. 49, insert the words "dog kennels" after the words "gas reservoir."

May 9, 1898.

To amend Sections 48 and 49 of the Building Ordinance, as published on February 21, 1898, in the Council Proceedings of that date, on page 1754.

Be it ordained by the City Council of the City of Chicago:

Section 1. That Sections forty-eight (48) and forty-nine (49) of the Building Ordinance of the City of Chicago, published February 21, 1898, in the Council Proceedings of that date, on page 1754, be and the same is hereby repealed and in lieu thereof the following words and figures be and the same are hereby passed and substituted, viz:

"Section 48. It shall be unlawful to erect, establish, build, construct or maintain any hospital for the treatment and nursing of any person or persons, animal or animals affected with any disease whatever, on any residence street, avenue or alley in the City of Chicago, until there be first obtained the written consent of the person or persons who may be the owners or agents of the entire frontage of the four sides of the block in which such building is to be located and the entire frontage of the block on the opposite side of the street or alley on which such building faces or abuts. Such written consent as is herein provided shall be filed with the Commissioner of Buildings before any permit shall be granted for the construction or erection of any building for such hospital.

"Section 49. It shall not be lawful for any person to locate, build, construct or keep on any street, avenue or alley in any block in which one-third of the buildings are devoted to exclusive residence purposes a livery, boarding or sale stable, gas house, gas reservoir or other building for any business purposes, unless the written consent of the property owners or agents on both sides of the street, avenue or alley in such block shall be first obtained and filed with the Commissioner of Buildings before a permit be granted for the construction or keeping of such buildings."

Sec. 2. This ordinance shall take effect and be in force from and after its passage.

June 20, 1898.

"Section 49. It shall not be lawful for any person to locate, build, construct or keep on any street, avenue or alley in any block in which one-third of the buildings are devoted to exclusive residence purposes a livery, boarding or sale stable, gas house or gas reservoir, unless the written consent of the property owners or agents on both sides of the street, avenue or alley in such block shall be first obtained and filed with the Commissioner of Buildings before a permit be granted for the construction or keeping of such buildings. Nor shall it be lawful for any person to locate, build, construct or keep on any street or avenue in any block in which all of the buildings are devoted to exclusive residence purposes, any building constructed or designed to be used for any business purpose whatsoever unless the written consent of a majority of the property owners or of the duly authorized agents of such owners of property on both sides of the street or avenue in such block shall first have been obtained and filed with the Commissioner of Buildings."

Sec. 2. All ordinances or parts of ordinances in conflict herewith are hereby repealed.

May 8, 1899. Sec. 49, by adding: "Provided, however, that in determining whether all buildings on any street, in any block, are devoted to exclusive residence purposes, buildings located on a corner lot, subdivided so that such lot does not front on the street to which such test is applied, shall not be taken into consideration, and any such building so located on any such corner lot shall not be considered as being on the street to which such test may be applied."

Be it ordained by the City Council of the City of Chicago:

Section 1. That Section 49 of the Building Ordinance, as passed March 28, 1898, and amended December 11, 1899, be and the same is hereby amended by adding the words, "laundry to be run by machinery," after the words, "blacksmith shop."

January 14, 1901.

December 11, 1899 Section 49 is amended by adding the words "Blacksmith's shop" after the word "Reservoir" and striking out the words "or other building for any business purposes."

Sec. 67 amended Feb. 19, 1900, by adding:

"All structural steel and iron work shall be so riveted that the distance from the center of the rivet hole to the edge of the material shall not be less than:

$\frac{5}{8}$-inch for $\frac{1}{2}$-inch rivets.

$\frac{7}{8}$-inch for $\frac{5}{8}$-inch rivets.

$1\frac{1}{8}$-inch for $\frac{3}{4}$-inch rivets.

$1\frac{3}{8}$-inch for $\frac{7}{8}$-inch rivets.

$1\frac{1}{2}$-inch for 1-inch rivets.

Wherever possible, however, the distance from the rivet hole to the edge of the material shall be equal to two diameters of such rivet hole. All rivets, wherever practicable, shall be machine driven; the rivets in connections shall be proportioned and placed to suit the stresses, and the pitch of rivets shall never be less than three diameters of the rivets, nor more than six (6) inches. All holes shall be punched accurately, so that upon assembling a cold rivet will enter the hole without straining the material by drifting. The rivets shall fill the holes completely, and, wherever necessary, gussets shall be provided of sufficient thickness and size to accommodate a number of rivets necessary to make a connection.

When steel or iron trusses are used the trusses shall be of such design that the stress in each member can be calculated, and all trusses when placed shall be held rigidly in position by an efficient system of lateral and sway bracing, and any member of a truss subjected to transverse stress in addition to direct tension or compression shall have the stresses causing such strain added to the direct stresses coming on the member, and the total stresses shall in no case exceed the stresses provided for in Section 92 of this ordinance.

On all buildings in process of construction, where the plans call for the use of trusses or iron and steel structural work, the erection of such iron and steel structural work and of such trusses shall be inspected daily by an inspector from the Building Department of the City of Chicago, and such inspector shall be a practical bridge and structural iron worker, and it shall be the duty of such inspector to see that the provisions of this ordinance are strictly complied with, and such inspector shall have the authority to compel the contractors and builders to use a sufficient amount of temporary bracing or guys necessary to insure the safety of the work during its erection and to

compel such contractors and builders to keep all derricks, tackles and hoisting appliances used in such work in a safe condition.

Whenever the plans of any building in process of construction, where iron and steel structural work is to be used, require bolting to be done, all holes shall be reamed and turned bolts used.

Sec. 2. This ordinance shall be in force and effect from and after its passage.

June 27, 1898. Add to Section 148, "To apply to new buildings only."

June 29, 1900.

Section 198 was amended as follows:

Be it ordained by the City Council of the City of Chicago:

Section 1. That the owner or agent of every building hereafter to be erected in the City of Chicago coming within the description of Classes 1, 2, 4 and 5, as classified in and by an ordinance passed by the City Council of the City of Chicago on the twenty-eighth day of March, 1898, known as the Building Ordinance, shall equip each and every window in any such building, above the second story thereof, with a suitable device or devices which will permit the cleaning of the exterior of each and every window in such building, above the second story, without danger to the person or persons cleaning such windows, such device or devices to be of such pattern and construction as will reasonably answer the purposes for which they are intended.

Section 2. Any owner or agent of any building described in the foregoing section who shall fail, neglect or refuse to comply with the provisions of this ordinance within ninety (90) days from the date of the passage of this ordinance, shall be deemed guilty of a misdemeanor and shall upon conviction thereof be fined a sum not less than ten ($10.00) dollars nor more than fifty ($50.00) dollars; and each and every day which shall be allowed to elapse after the expiration of ninety (90) days from the date of the passage of this ordinance, before any such building described in Section 1 hereof shall be supplied and equipped in accordance with the provisions of this ordinance, shall constitute on the part of the owner or agent of any such building a separate and distinct offense.

Section 3. This ordinance shall be in force and take effect from and after its passage and publication.

January 14, 1901. Sec. 210 added to. The following is the ordinance as passed:

Be it ordained by the City Council of the City of Chicago:

Section 1. Every building, lodging house and hotel in the City of Chicago, required by law to be equipped with metallic stand-pipes and wrought iron or steel balconies, or other fire escape devices, shall have displayed in conspicuous places, on each floor of such building, lodging house and hotel, notices, sufficient in number and in plainly legible type at least three-fourths of an inch in height, indicating and showing the location of such metallic ladders, balconies and fire escapes and the easiest way to reach them.

Sec. 2. Any owner or agent of any such building, lodging house or hotel who violates, disobeys, omits or neglects to comply with the terms of this ordinance shall be subject to a fine of not less than five ($5.00) nor more than fifty ($50.00) dollars, and every such owner or agent shall be deemed guilty of a separate offense for every day such violation, disobedience, omission or neglect shall continue, and shall be subject to the penalty imposed hereby for each and every such separate offense.

January 28, 1901. Sec. 210.

AN ORDINANCE

Declaring what shall be nuisances and providing for their abatement.

Be it ordained by the City Council of the City of Chicago:

Section 1. All sign-boards and bill-boards now or hereafter erected on any residence street within two hundred feet of any park, park boulevard or driveway, except sign-boards not exceeding three feet square used for advertising the sale or renting of the property on which they are located, and all signs on buildings on any residence street within said two hundred feet, except signs advertising the business within, are hereby declared to be public nuisances, and any such first described sign-boards or bill-boards now existing shall be removed by the owners thereof within thirty days after the passage of this ordinance, or upon failure thereof, the same shall be torn down and destroyed under the direction of the Commissioner of Buildings.

Sec. 2. Any person violating this ordinance shall be fined not exceeding one hundred dollars for the first offense, and for each subsequent offense shall be fined in a like amount and imprisoned not exceeding three months.

Sec. 3. This ordinance shall take effect and be in force from and after its passage.

Be it ordained by the City Council of the City of Chicago:

Section 1. That the ordinance passed by the City Council on the twenty-eighth day of March, A. D. 1898, and published on pages 2013 to 2070, inclusive, of the published Council Proceedings of March 28, 1898, be and the same is hereby amended by adding thereto the following words and figures, which shall be known as Section 212a, and which shall follow Section 212 of said ordinance:

"Section 212a. It shall be unlawful for any person to construct, maintain, or to allow or permit to remain, in or upon the roof of any building in the City of Chicago, any water tank of a larger capacity than four hundred (400) gallons, unless the said tank shall rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron girders which rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron or steel construction; provided, however, that no water tank of a capacity exceeding four hundred (400) gallons shall be constructed in or upon any building without first obtaining therefor a permit from the Commissioner of Buildings and paying therefor a fee of two ($2.00) dollars.

Sec. 2. This ordinance shall take effect and be in force from and after its passage and due publication.

May 13, 1901.

May 8, 1899. Sec. 219. The last clause to read: All fees and fines collected under the provisions of this ordinance shall be used in defraying the expense of the compilation and publication of the building ordinances of the city as aforesaid and from time to time as may be required, and any surplus shall from time to time be paid into the building department account.

MISCELLANEOUS ORDINANCES.

May 29, 1899.

AN ORDINANCE

To amend the building ordinance so as to permit frame buildings erected in the Thirty-third and Thirty-fourth Wards south of 67th street and 63rd street upon certain frontage petition.

Provided, however, that any person or corporation desiring to erect a frame or wooden building, to be used for residence or mercantile purposes, within that portion of the territory bounded on the east (between 67th and 75th streets) by Lake Michigan, on the south by the center line of Seventy-fifth (75th) street, on the west by the center line of State street to the intersection of Sixty-third (63rd) street; thence east along the center line of Sixty-third (63rd) street to the intersection of Cottage Grove avenue; thence south along the center line of Cottage Grove avenue to the intersection of Sixty-seventh (67th) street; thence along the center line of Sixty-seventh (67th) street to Lake Michigan, shall have a right to do so, within the limits above defined, upon presenting a petition to the Commissioner of Buildings of the City of Chicago, together with a plat, plans and specifications showing the place where such building is to be erected. Such petition shall be verified by the affidavit of the applicant and shall contain the written consent of the owner of a majority of the frontage upon each side of the street upon which the building is to be erected for a distance of five hundred (500) feet each way. No frame or wooden residence or mercantile building shall be erected within the said limits exceeding forty (40) feet in height, except the basement story shall be constructed of brick or stone, when the height shall not exceed forty-five (45) feet above the sidewalk.

January 14, 1901.

AN ORDINANCE

To regulate the congregating and crowding on the roofs of houses and buildings.

Be it ordained by the City Council of the City of Chicago:

Section 1. It shall be unlawful for any person whether owner, lessee, manager or person in control or having charge of any building within the city limits of the City of Chicago to permit the use of the roof of such house or building, whether free of charge or through admission fee, to any person or persons as a place of observation or for spectatorial purposes, unless he has first obtained from the Commissioner of Buildings of the City of Chicago a permit; provided, however, it shall not be unlawful for any person, whether owner, lessee or the person in control or having charge of such house or building to permit the roof of any such house or building to be used as a place of observation or for spectatorial purposes for a number of persons not exceeding ten, and when no admission fee is charged.

Sec. 2. Before issuing the permit as provided for in the foregoing section the Commissioner of Buildings shall make an investigation as to whether said building is safe and secure enough to permit the crowding of an estimated number of persons upon the roof of such house or building, and the permit so issued shall state the number of pesons to be permitted on such roof.

Sec. 3. The person requiring such permit as hereinabove provided for shall make application to the Commissioner of Buildings for such an investigation, and shall pay, as a fee for such investigation and such permit, a sum not to exceed five dollars.

Sec. 4. Any person or persons whether owner, lessee, manager or person having charge or control of any such house or building within the city limits of the City of Chicago who shall permit, allow or tolerate the use of the roof of such house or building so controlled by him, by any person or persons for a purpose within the meaning of this ordinance without first obtaining a permit as hereinabove provided for and without having the safety of such roof tested and investigated by the Commissioner of Buildings as herein provided for, or permitting a larger number of persons than provided for in his permit to congregate upon such roof, shall be fined for each and every violation of this ordinance in a sum not less than $20 nor more than $100.

Sec. 5. This ordinance shall be in force from and after its passage.

AN ORDINANCE

Passed October 22, 1900.

Section 1. In every factory, workshop, or other place or structure where machinery is employed the belting, shafting, gearing, elevators and every other portion of machinery when so located as to endanger the lives and limbs of those employed therein while in the discharge of their duties shall be, as far as practicable, so covered or guarded as to make them reasonably safe and to prevent injury to such employes.

Sec. 2. The enforcement of this ordinance shall be under control of the factory inspectors of the city Health Department.

ORDINANCES IN REGARD TO ELEVATORS.

An ordinance passed November 13, 1899, to improve the construction, operation, service and safety of passenger and freight elevators.

Be it ordained by the City Council of the City of Chicago:

Section 1. **Permit for Construction.**—Before proceeding with the construction of any passenger or freight elevator (except such as are hereinafter excepted from the provisions of this ordinance) there shall be obtained by the owner or agent of the building in which such elevator is to be constructed, a permit for such construction from the Commissioner of Buildings; and it shall be unlawful for any such owner or agent to proceed with, permit or allow the construction of any such elevator within the corporate limits of the City of Chicago, unless such permit shall have been previously obtained from the Commissioner of Buildings; and any owner or agent of any building wherein any such elevator or elevators is or are being, or is or are about to be constructed, who causes, permits or allows such construction, or permits to be constructed any such elevator or elevators, or who permits or allows any attempt to construct any such elevator or elevators, without having previously obtained the permit hereinbefore provided, shall be fined in a sum of not less than fifty ($50.00) dollars nor more than two hundred ($200.00) dollars.

Sec. 2. **Testing of Safety Devices and Fine for Interference.**—Every passenger or freight elevator hereinafter constructed (except such as are hereinafter excepted from the provisions of this ordinance) in any building within the corporate limits of the City of Chicago shall be provided with some efficient device to secure the safe operations of such passenger or freight elevator in its running up or down, and such device shall be subjected to such practical test as may be determined by the Commissioner of Buildings to ascertain the efficiency of such safety device to properly perform the service for which it is intended; and it shall be the duty of the Commissioner of Buildings to cause to be made such test of each and every device upon any such elevator hereafter constructed, and no such elevator hereafter constructed shall be permitted to run until inspection herein provided for has been made and a certificate issued from the Commissioner of Buildings or such inspector that the same has been inspected, which such certificate shall be posted in a conspicuous place in such elevator. Every passenger or freight elevator now in operation within the corporate limits of the City of Chicago, or which may be hereafter constructed and operated, shall be provided with some efficient device to procure the safe operation of such passenger or freight elevator in its running up and down, and such device shall be subjected to the same test herein provided for elevators to be hereafter constructed, and a certificate of such inspection issued as provided for elevators to be hereafter constructed, and every such elevator now in operation within the corporate limits of the City of Chicago, or which may hereafter be constructed and operated in the City of Chicago, shall be inspected under and by authority of the Commissioner of buildings at least once every six (6) months. Every owner or agent of any building who fails to comply with any provision or provisions of this section of this ordinance shall be fined in a sum of not less than fifty ($50.00) dollars nor more than two hundred ($200.00) dollars; and every owner or agent of any building wherein any passen-

ger or freight elevators are situated in the City of Chicago who refuses to permit the inspection of any such elevator or who refuses to permit the making of the test in this section of this ordinance provided, shall be fined in a sum of not less than twenty-five ($25.00) dollars nor more than two hundred ($200.00) dollars for each and every day which such elevator runs or is operated on and after the day and date of the refusal to permit inspection of such elevator or elevators or the refusal to allow such test to be made.

Sec. 3. **Commissioner Must Test Safety Within Six (6) Months from Passage of the Ordinance.**—Every passenger or freight elevator now running or operating within the corporate limits of the City of Chicago, or which may hereafter be constructed and run and operated, shall be provided with some efficient device for the purpose of preventing the cab or car of such elevator from falling, or the securing of the safety of the cab or car and its load, in case it should fall, and all such devices that are applied to such passenger or freight elevator for the purpose of preventing such cab or car from falling or for stopping it in case it does fall, shall be subjected to a practical test to determine the efficiency of such device and to secure the safety of the cab or car and its contents. Every such passenger or freight elevator shall be provided with the device hereinbefore in this section of this ordinance set forth within six (6) months from and after the passage of this ordinance; and it shall be the duty of the Commissioner of Buildings to cause to be made the test hereinafter provided for within not less than nine (9) months from and after the passage of this ordinance, and every person, whether owner or agent, of any building wherein any such passenger or freight elevator within the corporate limits of the City of Chicago is now run or operated, or which may hereafter be constructed or operated, who shall fail or neglect to provide such passenger or freight elevator with such device for the purpose of preventing the cab or car from falling, or the securing of the safety of the cab or car in case it should fall, shall be fined in a sum of not less than twenty-five ($25.00) dollars nor more than two hundred ($200.00) dollars, for each and every day that such elevator is run or operated without being provided with such device.

Sec. 4. **Liability of Owner in Refusing Tests.**—Any owner or agent of any building wherein any passenger or freight elevator is run or operated within the corporate limits of the City of Chicago, who desires to have a test made by and under the authority of the Commissioner of Buildings as to whether such elevator or elevators is provided with the device mentioned in Section 3 of this ordinance, shall or may notify said Commissioner of Buildings in writing that such a test is desired and the time when such test may be made, which shall be not less than two (2) nor more than ten (10) days after such notice is given to the Commissioner of Buildings; and it shall be the duty of every owner or agent of any such building wherein any such passenger or freight elevator is run or operated in the City of Chicago, or which may hereafter be constructed and operated, to permit the making of the test of the device provided for in Section 3 of this ordinance upon demand being made by the Commissioner of Buildings or duly authorized Inspector, and every owner or agent of any such building wherein any such passenger or freight elevator is run or operated, or which may be hereafter constructed and operated, who refuses to permit the test of the device provided for in Section 3 of this ordinance, to be made upon demand of such Commissioner of Buildings or Elevator Inspector, within five (5) days from and after such demand is made, shall be fined not less than twenty-five ($25.00) dollars nor more than two hundred ($200.00) dollars for each and every day such passenger or freight elevator is run or operated after such demand for and refusal of the making of such test.

Sec. 5. **Certificate Furnished Certifying to the Tests.**—Whenever the test of the device provided for in Section 3 of this ordinance has been made, it shall be the duty of the Commissioner of Buildings or Inspector of Elevators to cause to be issued a certificate of the making of such test, which certificate shall set forth whether or not such test is found sufficient and satisfactory, and each certificate shall be furnished to the owner or agent of the building wherein such elevator is operated, and shall be posted in a conspicuous place in said elevator.

Sec. 6. **Tests to be Made Semi-Annually.**—It shall be the duty of the Commissioner of Buildings to cause the test to be made as provided for in section 3 of this ordinance of each passenger and freight elevator in the City of Chicago at least once in six (6) months from and after the making of the test or the issuance of the certificate therefor.

Sec. 7. **Duties of Inspectors.**—Whenever any Inspector of any passenger or freight elevator finds any of the running parts or automatic devices out of order or in an unsafe condition he shall immediately report the same to the Commissioner of Buildings, together with a statement of all the facts relating to the condition of said elevator or elevators.

Sec. 8. **Power to Shut Down Elevators.**—It shall be the duty of the Commissioner of Buildings, upon receiving report from any inspector of the unsafe condition of any elevator, to order said elevator to be stopped from use until the same may be placed in a safe condition, and any owner or agent of any building wherein any such passenger or freight elevator is run or operated, within the corporate limits of the City of Chicago, who permits or allows any such elevator to run after the receipt of the notice, in writing, from the Commissioner of Buildings that any such elevator is out of order, or is in an

unsafe condition, shall be fined in a sum not less than twenty-five ($25.00) dollars nor more than two hundred ($200.00) dollars for each and every day such elevator is run or operated without being put in a safe condition or placed in good order.

Sec. 9. **Device That Will be Satisfactory.**—Any device which shall prove efficient for the purposes hereinbefore described in this ordinance shall be approved by the Commissioner of Buildings, if, after a test by said Commissioner or any of his elevator inspectors, it is found that such device or devices satisfactorily perform the work it is intended should be performed by such device or devices in and by the provisions of this ordinance.

Sec. 10. **Does Not Repeal Former Ordinances.**—The certificates and inspections herein provided for shall be made at the same time that the inspections provided for by Sections 29, 30 and 31 of an ordinance passed March 28, 1898, known as the "Building Ordinance," are made. The provisions of this ordinance shall not be so construed as to repeal, alter or change any of the provisions of Sections 28, 29, 30 and 31 of said "Building Ordinance" of March 28, 1898, and the fee required to be paid in and by said Section 30 of said "Building Ordinance" of March 28, 1898, shall include the cost of any inspection and the issuance of any certificate provided for in and by this ordinance, it being intended that this ordinance be construed as an addition to the provisions of the "Building Ordinance" of March 28, 1898, in so far as it relates to the inspection of elevators.

Sec 11. **Elevators Exempt from Safety Devices.**—The provisions of this ordinance shall not apply to any elevators in any private residence not more than three stories in height, elevators running between two floors only of any building, nor to any hand hoists, elevator or hoist used solely for hoisting materials, tools or workmen in any building in course of construction.

Sec. 12. This ordinance shall be in force and effect from and after its passage and publication.

SMOKE ORDINANCE.

MUNICIPAL CODE.

Sec. 1650. The emission of dense smoke from the smokestack of any boat or locomotive, or from any chimney anywhere within the city, shall be deemed and is hereby declared to be a public nuisance, *provided*, that chimneys of buildings used exclusively for private residences shall not be deemed within the provisions of this ordinance.

1651. The owner or owners of any boat or locomotive engine, and the person or persons employed as engineer or otherwise, in the working of the engine or engines in said boat or in operating such locomotive, and the proprietor, lessee, or occupant of any building, who shall permit or allow dense smoke to issue or be emitted from the smokestack of any such boat or locomotive, or the chimney of any building within the corporate limits, shall be deemed and held guilty of creating a nuisance, and shall for every such offense be fined in a sum not less than Five Dollars nor more than Fifty Dollars.

1652. It shall be the duty of the Commissioner of Health and the Superintendent of Police, to cause Sections 1650 and 1651 of this article to be enforced, and to make complaint against and cause to be prosecuted all persons violating the same.—

—*See Harmon vs. City of Chicago, 110 Ill. Rep. p. 400.*

RULES FOR PIPING BUILDINGS

For Distribution of Manufactured and Natural Gas.

ISSUED BY

THE PEOPLE'S GAS LIGHT AND COKE COMPANY, CHICAGO.

MANUFACTURED GAS FOR LIGHT AND FUEL.

The following rules have been adopted by the People's Gas Light & Coke Co., governing the piping of buildings for the distribution of manufactured gas for light and fuel.

The table given below shows the proportionate size and length of tubing allowed for residences, flats and stores.

Information will be furnished upon application relative to the piping of churches, theaters or public buildings where large chandeliers or sun burners are to be used.

FOR LIGHT.			FOR FUEL.		
Size of Tubing.	Greatest Length Allowed.	Greatest No. of openings allowed	Size of Tubing.	Greatest Length Allowed.	Greatest No. of openings allowed
⅜ inch	20 feet	2	¾ inch	30 feet	1
½ "	30 "	3	1 "	70 "	2
¾ "	50 "	8	1¼ "	100 "	3
1 "	70 "	12	1½ "	150 "	5
1¼ "	100 "	20	2 "	200 "	10
1½ "	150 "	35			
2 "	200 "	50			

The risers in any building must be not less than twenty inches from the floor for two to ten openings.

Two feet six inches for ten to thirty openings.

Four feet for thirty to sixty openings.

Five feet for sixty to one hundred openings.

Six feet for over one hundred openings.

Where meters are to be set on the wall, no riser must be higher than nine feet from the floor.

No riser in any building must be less than ¾ inch, and in stores should not end under deck of show window.

All risers must be brought to front of building and within eighteen inches of wall or partition.

The risers in all buildings must be carried up an inside partition out of reach of frost, and must be placed where the meter and stop-cock can be readily got at.

In no case will a meter be set where it is not easily accessible or where it is exposed to frost and dampness, or liable to injury from any cause.

Building services must be run from front of building, and header provided where meters are set in groups, and openings provided where set in flats.

All pipe for fuel must be run independent and connected to light riser at meter end.

Where meter sets in flat, fuel pipe must be run overhead.

Supply for gas engines must be independent, and separate service will be required.

All openings must be closed with iron caps. No split pipe or broken fittings repaired with cement or lead will be allowed.

Drops in parlors or large rooms of dwellings must be not less than ½ inch.

All branches or cross lines of pipe from the main line must have a set of not less than four inches, dropped square, and must be well secured to the joists by gas hooks.

All drops on branch lines and openings for side brackets must be square bends, no fittings allowed.

Underground work by gasfitters between main and meter will not be allowed or accepted.

All pipe must be examined by the inspector of this company before being concealed, and due notice must be given by gasfitters when any pipe is ready for inspection.

All work must be proved with mercury gauge, not less than a six-inch column of mercury being allowed.

It is the purpose of the company to strictly enforce the above rules, and no certificate of inspection will be given when they are not complied with.

Architects, builders and owners of buildings are requested to allow no bill for gasfitting unless accompanied by a certificate of inspection.

THE PEOPLES GAS LIGHT & COKE CO.

This Company has adopted the following standard of sizes of pipe for the distribution of natural gas for fuel, in buildings; and rules and regulations for the guidance of gas fitters.

Systems of piping must conform to these specifications before they will be accepted by the Company's inspectors and before connection will be made with the Company's mains.

First. Piping must be tested with air at a pressure of five pounds to the square inch. At this pressure a mercury column will stand at a height of ten inches, and it must remain stationary at that height until passed by the Company's inspector, and before a certificate of inspection will be issued. All pipes must be examined while exposed.

Second. Due notice shall be sent to the Company's office by the gas fitter when any pipe is ready for inspection.

Third. The following table shows, in each case, the smallest size pipe which will be accepted, to supply one each of the various appliances:

CLASSIFICATION OF APPLIANCES.	Size of Pipe.	Greatest Length of Pipe Allowed
Gas cooking range	¾ inch	30 feet
Ordinary coal range equipped for use of gas	¾ inch	30 feet
Small portable gas cooking stove	½ inch	20 feet
Kitchen boiler heater, when separate from range	½ inch	20 feet
Small portable gas heating stove	½ inch	20 feet
Large heating stove	¾ inch	30 feet
Gas log or other grate fire	¾ inch	30 feet
Hot air furnace for heating ten room buildings, or less	1¼ inch	70 feet
Hot air furnace for heating ten to fifteen room buildings	1½ inch	100 feet
Low pressure steam or circulating water boiler for heating ten room houses or less	1½ inch	100 feet
Low pressure or circulating water boiler for heating ten to fifteen room houses	2 inch	140 feet
Miscellaneous appliances consuming less than fifteen cubic feet of gas per hour each	½ inch	20 feet
Miscellaneous appliances consuming fifteen to forty cubic feet of gas per hour each	¾ inch	30 feet
Miscellaneous appliances consuming forty to seventy-five cubic feet of gas per hour each	1 inch	60 feet
Low pressure or circulating water boiler for heating sixteen to twenty-six rooms	2½ inch	200 feet
Low pressure or circulating water boiler for heating twenty-seven to forty-five rooms	3 inch	300 feet
Low pressure or circulating water boiler for heating forty-six to seventy-five rooms	4 inch	400 feet

For special purposes, not provided for above, apply to the Company for information.

Fourth. Half inch pipe is the smallest size which will be allowed.

Fifth. If more than one stove or other appliance is to be supplied from one run of pipe, the size of this run shall be increased proportionately to the amount of gas it will be expected to supply. For instance, it requires a ¾ inch pipe to supply a gas cooking range; if a large heating stove were to receive its supply of gas from the same run of pipe which supplied this cooking range, the run should be 1¼ inch pipe instead of ¾ inch.

Sixth. If the above rules concerning the size of pipes are not clearly understood in each case, communicate with the Company's inspector. If unusual conditions are met, which the above rules do not cover, communicate with the Company's inspector.

Seventh. No main riser will be allowed of less than one inch pipe, and risers must be placed out of the reach of frost, and must be located:

a. That the meter can be placed conveniently for reading the index.

b. That the meter will not be exposed to damp or frost, or be liable to injury from any cause.

c. That the stop-cock placed at the inlet side of the meter can be readily reached by the consumer and the Company.

d. That the meter will not be placed more than eight feet from the ground.

Eighth. Where outlets are provided for, but remain closed, iron caps must be used. No split pipe or broken fittings repaired with cement or lead, will be allowed.

Ninth. Where systems of piping are concealed within plaster, or between floors; if side openings or nipples are used, joints must be made secure with solder or lock nuts to prevent turning inside the plaster, or between floors. All pipes must be supported with iron straps or gas hooks.

Tenth. In all cases where extensions are made, care must be taken to break pipe where the rule for sizes can be maintained, and in no case shall extensions be made from small pipe.

In the interest of the Company's patrons, and the best gas service, the above rules and regulations will be rigidly enforced. Strict compliance with each will be necessary to obtain a certificate of inspection.

THE PEOPLES GAS LIGHT AND COKE COMPANY,
Supplying Natural Gas.

RULES AND REGULATIONS

GOVERNING THE EQUIPMENT OF BOILERS AND FURNACES FOR THE USE OF NATURAL GAS AS A FUEL.

Low Pressure Steam and Hot Water Circulating Boilers.

1. Use two-inch cast-iron burner with flattened mouthpiece. For water-leg boilers, use this style with the mouthpiece at an angle of 45 degrees and set so that the mouth of the burner is about three inches above the grate line, and about three inches from side of firebox. For return tubular boilers, use the straight burners with flattened mouthpiece set at right angles to the length of the boiler and from 10 to 14 inches below the shell. For each of the above styles of burners, use mixer having flaring opening for the air and a wire screen covering for the air and gas openings.

NOTE. (a) Special combinations of these two styles of burners can be used to advantage for certain types of boilers. We would recommend consultation with the company's representatives in all special cases.

(b) Burners and mixers, such as are described above, are carried in stock by the Claybourne Burner Company, 1770 Old Colony Building.

2. Arrange the valves and burners so that one burner will be controlled by one valve, two burners by a second valve, and the balance of the burners, up to the requisite number, in batteries with a separate valve controlling the supply to each four burners.

3. Drill mixer-pins for the single and double burners, 3-16-inch each. Drill mixer-pins for balance of the burners, 7-32-inch each.

4. Place sheet-iron across the firebox between the mixers and the top of the burners in such a manner as to exclude air from the firebox, except what passes through the mixers.

5. The header must be the full size of the pipe leading to the boiler, as specified in the company's rules for piping for natural gas. Do not take the supply pipe for any other appliances off the header supplying the boiler.

6. There must be a globe valve on the main line leading to the header within easy reach, which can be used to entirely shut off the supply of gas from the header.

7. There must be a union between the first valve on the header and the nearest fitting on the pipe.

8. Use one-inch globe valves on the reaches from the header supplying the burners.

9. Do not put in pilot lights. They are unnecessary unless a regulator is used. If a regulator is used, the pilot lights will be put in by the regulator company at the time the regulator is installed.

Hot Air Furnaces.

Use the Claybourne Improved Cross Burner with auxiliary, or the Vulcan Round Sectional Burner with mixers which have flaring opening for air and wire screen covering both air and gas openings.

Directions for Installing Cross Burners.

1. Set the burner with bottom of burner on grate line. Put mixer for the main burner on horizontal pipe, using a 10-inch nipple between the mixer and the ell turning up toward the burner. Drill opening in mixer-pin ¼-inch. Place the mixer for the

"Alberene."

The best Laundry Tub, Kitchen Sink, and Urinal Stall that can be made. Natural Stone, Guaranteed, Low Priced.

Our Catalog tells you all about it.

Alberene Stone Co.,

CHICAGO. NEW YORK. BOSTON.

R. J. McILROY, Prop. **TELEPHONE SOUTH 1196.** J. H. McILROY, Supt.

McILROY'S CORNICE WORKS,

MANUFACTURERS OF

GALVANIZED IRON AND COPPER CORNICES.

Skylights, Ventilators, Gutters, Etc. Slate, Tin, Tile and Corrugated Iron Roofers.

1519-21 STATE ST., CHICAGO.

W. S. MEYER, President. M. DOUGHERTY, Secretary. JOHN M. STILES, Treasurer.

Builders' Painting and Decorating Company

(Incorporated)

185 DEARBORN STREET, ROOM 603,

BRANCHES:
211 31st Street, Telephone South 1244.
282 31st Street, Telephone South 880.
269 35th Street, Telephone Oakland 379.

CHICAGO.

Telephone Central 3297.

PAUL F. P. MUELLER.

823 SCHILLER BUILDING,
CHICAGO.

TELEPHONE CENTRAL 3190.

BUILDING CONSTRUCTION,

GENERAL CONTRACTOR.

BRANCH OFFICE, HOUGHTON, MICH.

C. ANDERSEN, Pres. *FRED. D. BREIT, Sec. and Treas.*

TELEPHONE 181 CENTRAL.

Central Wrecking Co.,

Office, 401 U. S. Express Bldg., 87-89 WASHINGTON ST., CHICAGO.

Fire Wreckers, Excavators and Teaming Contractors.

Yards, 41-43-45 Chicago Avenue.

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Telephone 3508 Central.

FAN AND POWER MOTORS,
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BELLS, SPEAKING TUBES, Etc.

Arcade Steam Heating Co.,

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STEAM AND HOT WATER HEATING.

Estimates Furnished.
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C. W. RANDOLPH,

Felt, Gravel, Slate, Tin and Canvas

Roofing.

825 AND 827 CLIFTON AVENUE,
Half Block North of Belmont Ave. CHICAGO.

auxiliary burner on the vertical pipe and drill the mixer-pin No. 30 Morse Twist. Place deflector furnished with burner on top of auxiliary burner and lay fire-brick lapping over the edge of the deflector, leaving a space two to five inches all around between the fire-brick and the side of the firepot.

2. Sheet-iron must be placed between the mixers and the burners in such a way as to entirely exclude air from the firepot, except what passes through the mixers.

3. Make header for furnace same size as run to the furnace, with one-inch opening for main burner and one-half inch opening for auxiliary burner.

4. Use one-inch globe valve for main burner and one-half inch globe valve for auxiliary burner.

5. There must be a globe valve on the main line leading to the header within easy reach, which can be used to entirely shut off the supply of gas from the header.

6. There must be a union between the first valve on the header and the nearest fitting on the pipe.

7. Do not use pilot lights. They are unnecessary unless a regulator is used. If a regulator is used, the pilot lights will be put in by the regulator company at the time the regulator is installed.

Directions for Installing the Vulcan Round Section Burner.

1. Burners from 14 to 18 inches in diameter must be of at least three sections, with a separate globe-valve controlling the supply of gas to each section.

2. Burners 20 inches in diameter or more must be of at least four sections, with a separate valve controlling the supply of gas to each section.

3. Burners must be placed so that the outside rim of the burner will be not less than one inch, or more than two inches, from the sides of the firepot.

4. Burners should be placed on a level with the center line of the fire if coal was used; usually about four inches above the grate line.

5. There must be a globe valve on the main line leading to the header within easy reach, which can be used to entirely shut off the supply of gas from the header.

6. There must be a union between the first valve on the header and the nearest fitting on the pipe.

7. Sheet-iron must be placed between the mixers and the burners in such a way as to entirely exclude air from the firepot, except what passes through the mixers.

8. Make openings in the mixer-pins for each section of the burner the size of No. 19 Morse drill.

9. Mixers must not be put on the horizontal pipe leading from the header to the ashpit.

10. Do not use pilot lights. They are unnecessary unless a regulator is used. If a regulator is used, the pilot lights will be put in by the regulator company at the time the regulator is installed.

N. B.—The above specifications are the result of careful experiments made by the company with a view to determining the kind of burners and arrangement which give satisfactory and economical results. The company does not assume any responsibility for the work of gasfitters, but will send competent inspectors, if requested, to examine burners and equipment and will give the benefit of the judgment of these inspectors to consumers, without charge.

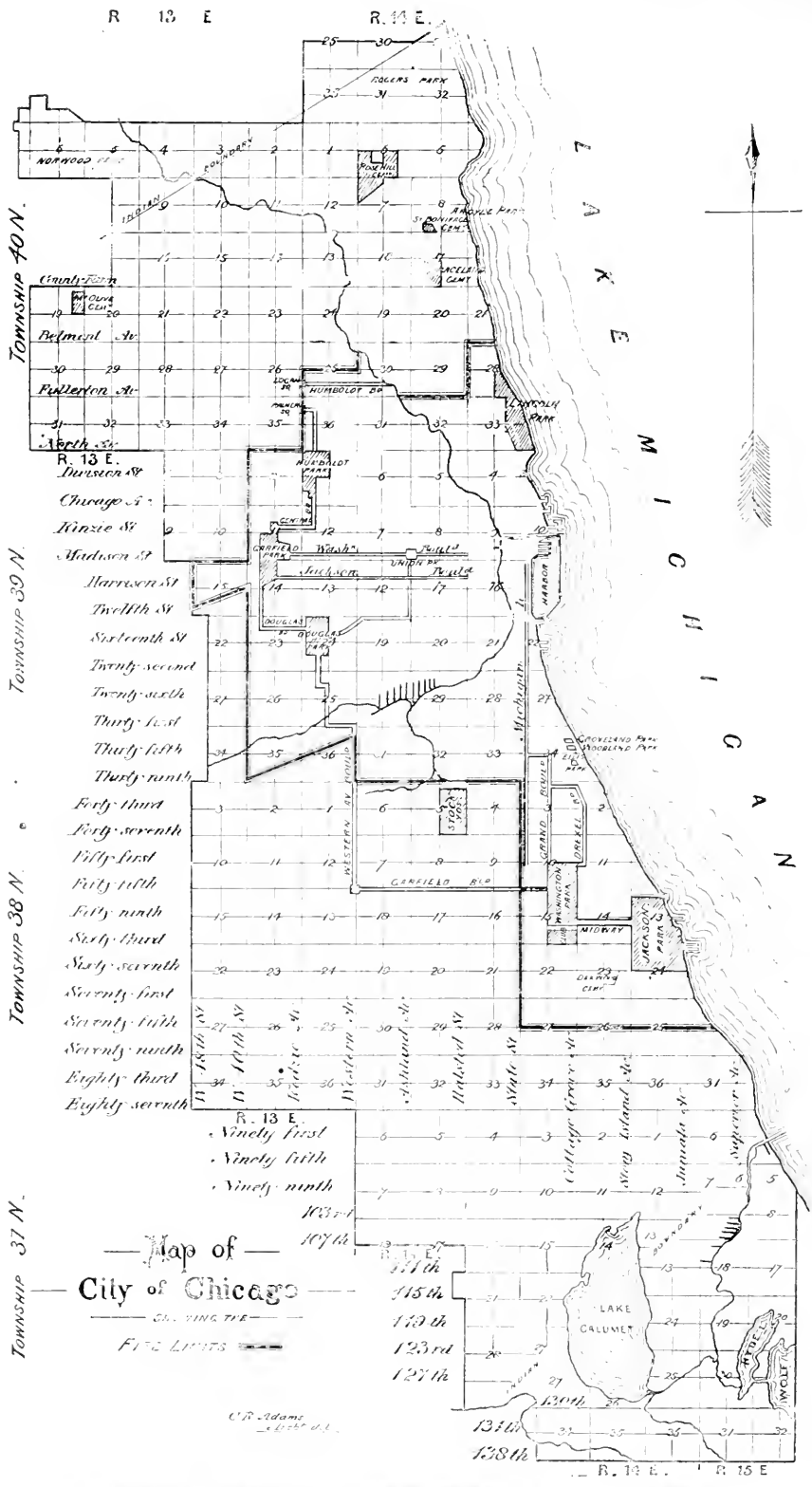
Notes.

1. It is of the utmost importance in all cases that there should be dampers which will effectually control the draft and remain set in any position desired. The pipe leading to the chimney and the chimney flue should be examined and cleaned. Too much draft is expensive, because of the waste of heat up the chimney. Too little draft causes imperfect combustion and a bad odor from the products of combustion in the basement and throughout the house. Good dampers and proper adjustment of them are as important as good burners.

2. For furnaces having a square firebox, use the Claybourne Box burners, or the Holland Box burner. Cover with four to six inches of broken firebrick. These burners should be set about six inches from center to center, with a separate valve controlling the supply to each burner. Drill the mixer-pins for either of these styles of burners, No. 19 Morse drill.

3. For water heaters with circular firepots such as the Wilks, Tobasco, etc., or for small hot-water circulating boilers use the same equipment as for ordinary hot-air furnaces except that if Vulcan burner is used it should be covered with about six inches of broken firebrick.

4. As natural gas is becoming more and more generally used in all kinds of appliances, it frequently happens that special forms or arrangements of burners are necessary. The company's representatives will be pleased to consult with gasfitters or customers in regard to what form of equipment would be most likely to give satisfactory results in any special cases.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TOWNSHIP 39 N.
TOWNSHIP 38 N.
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Fullerton Av.
North Av.
Division St
Chicago Av.
Kinzie St
Madison St
Harrison St
Twelfth St
Sixteenth St
Twenty-second
Twenty-sixth
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Humboldt Park
Douglas Park
Lincoln Park
Jackson Park
Washington Park
Midway
Garfield Blvd
Grand Boulevard
Western Av. Boulevard
Union Park
Lake Calumet
Hyde Park
Wolf Lake
Map of
City of Chicago
SHOWING THE
FIRE LIMITS

ORDINANCE FOR EXTENSION OF FIRE LIMITS.

(Passed December 11, 1893.)

That the fire limits of the City of Chicago be, and the same are hereby extended, so as to include the territory bounded on the east by the center line of West Fortieth street, on the west by the center line of West Forty-sixth street, on the south by the center line of Colorado avenue and on the north by the center line of Madison street.

This ordinance shall be in force from and after its passage.

The fire limits of the City of Chicago are hereby extended so as to include all that part of the city lying west of the Chicago river, east of Kedzie avenue, nort of North avenue and south of Diversey avenue.

This ordinance shall be in force from and after the first day of May, 1895.

That the fire limits of the City of Chicago are hereby extended so as to include the territory bounded on the east by the shore of Lake Michigan, on the west by the center line of State street, on the south by the center line of Seventy-fifth street, and on the north by the center line of Sixty-seventh street; provided, however, that any person or corporation desiring to erect or remove a frame or wooden building within the above defined limits, shall have the right to do so upon presenting a petition to the Commissioner of Buildings, signed by the owners of a majority of the front feet for a distance of 500 feet each way from said lot upon each side of the street upon which the building is to be located.

NOTE.

Fire Limits.—On the south by Seventy-fifth street from the lake to State street, west by State street to Thirty-ninth street, south by Thirty-ninth street to South Western avenue, west by South Western avenue to the Illinois and Michigan canal, south by the Illinois and Michigan canal to Crawford avenue, west by Crawford avenue to Colorado avenue, south by Colorado avenue to West Forty-sixth street, west by West Forty-sixth street to Madison street, north by Madison street to Crawford avenue, west by Crawford avenue to West North avenue, north by West North avenue to Kedzie avenue, west by Kedzie avenue to Diversey avenue, north by Diversey avenue to the Chicago river, east by the river to Fullerton avenue, north by Fullerton avenue to Halsted street, west by Halsted street to Belmont, north by 150 feet north of the north line of Belmont avenue to the lake.

May 1, 1899, was added: Also that territory bounded on the north by the center line of Harrison street, on the west by the center line of South Forty-eighth avenue, and on the south by the center line of Twelfth street, and on the east by the present city fire limits.

Extending the fire limits of the City of Chicago.

Section 1. That Section 669 of the Revised Code of the City of Chicago by which the fire limits of the City of Chicago are established, be and the same is hereby amended by the addition of the following:

Also that territory bounded as follows: Beginning at the intersection of the center line of West Twelfth street with the center line of Crawford avenue (otherwise known as Fortieth avenue); thence south along the said center line of Crawford avenue (otherwise known as Fortieth avenue) to the center line of West Twenty-second street; thence west along the center line of West Twenty-second street to the center line of West Forty-sixth street; thence north along the center line of West Forty-sixth street to the center line of West Twelfth street; thence east along the center line of West Twelfth street to the place of beginning.

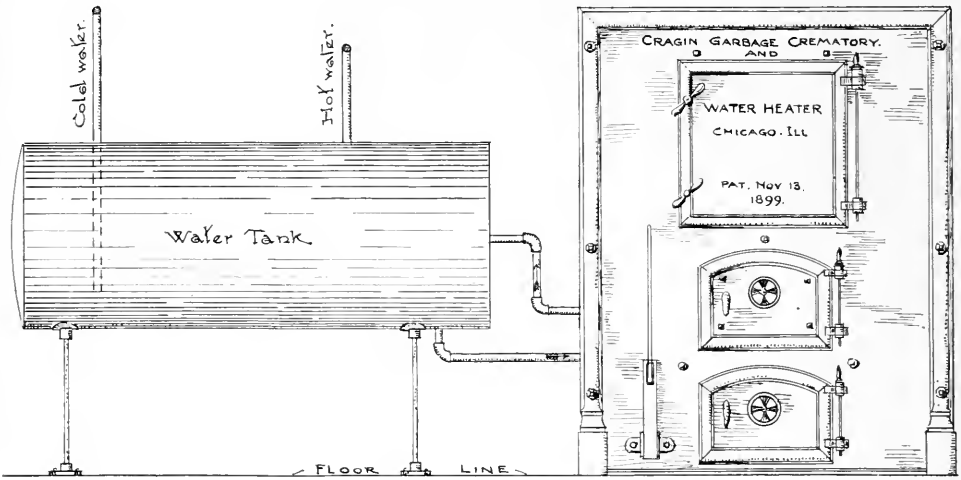
Further changes have been made since the passage of the above. The establishment of fire limits at South Chicago, embracing a section in which the construction of frame buildings is prohibited, bounded by Manistee avenue, Eighty-ninth street, Mackinaw avenue, to Harbor avenue, to the railroad tracks, back to Manistee avenue. In the West Division the section in which frame buildings may be erected is also more confined, the fire limits having been extended recently to include the section bounded by Kinzie street on the north, west to the city limits at West Fifty-second avenue, to Madison street, east to Forty-eighth avenue, south to Twelfth street, and east to Forty-sixth avenue, thence south to West Twenty-second street and east on the latter to Fortieth avenue.

May 20, 1901.

Cragin Combined Garbage Crematory and Hot Water Heater.

285 43d STREET, CHICAGO.

PHONE OAK 1086.



In this Crematory we have the most economical hot water heater ever put on the market. The garbage is a part of your fuel, and aside from heating water for all purposes it burns all garbage and refuse about a building, without the slightest odor, thus keeping everything in a sanitary condition. We give below the locations of a few in use here in Chicago We make different sizes suitable for residence, apartment buildings or hotels.

Write or telephone for catalogue.

Cragin Garbage Crematory Co.,
285 43d STREET, CHICAGO.

OWNERS AND LOCATIONS.

Below we give a few names of owners and locations of buildings in which we have placed our Crematories.

Dr. Henderson, Lakeside Hospital, 41st St. and Lake Ave.
Samuel Gregsten, the Windsor-Clifton Hotel, Wabash and Monroe.
E. H. Salsbury, N. E. Corner 51st St. and Washington Ave.
Frank Brush, S. W. Corner Lill Ave. and Halsted St.
Dr. J. Ramsay Flood, S. W. Cor. 62d St. and Madison.
T. J. Leonard, N. E. Cor. 54th St. and Woodlawn Ave.
John R. Taylor, S. E. Corner 54th Place and Jefferson.
Thos. G. Otis, 45th St. and Lake Ave.
Collins & Morris, S. E. Cor. 60th St. and Woodlawn Ave.
T. J. Leonard, N. W. Cor. Lawrence and Winthrop.
E. H. Salsbury, Lincoln, Nebraska.
C. F. White, N. E. Cor. 66th St. and Washington Ave.
White & Coleman, N. E. Cor. Jackson Park Terrace and Washington Ave.
L. C. Wagner, S. E. Cor. 64th St. and Kimbark Ave.
Joseph Cormack, N. W. Cor. 65th St. and Kimbark Ave.
Richard Curran, S. E. Cor. Calumet and 58th St.
H. B. Hall, S. W. Cor. 59th St. and Prairie Ave.
W. J. Neebes & Co., S. E. Cor. 46th St. and Indiana Ave.
S. T. Cooper, 46th St. and Indiana Ave.
C. R. Cave, S. W. Cor. 48th St. and Indiana Ave.
A. E. Robinson, 5211 Jefferson Ave.
C. W. Hoff, 4323 Grand Boul.
C. J. Trainor, 4331 Grand Boul.
W. K. Gore, 5205 Calumet Avenue.
W. K. Gore, 55th St. and Calumet Ave.
W. K. Gore, 5211 Calumet Ave.
C. E. Bartley, Drexel Ave. and 47th St.
Lehman Estate, Clark and Center St.
S. Harnstrom, S. E. Cor. Evanston Ave. and Melrose.
S. R. Frazier, 46th Place and Vincennes.
Porter Estate, 2321 State State.
J. S. Coonley, 5220 East End Ave.
A. K Mose. N. E. Cor. W. N. Ave. and Whipple.
Meadowcroft, N. W. Cor. Lawrence and Kenmore.
Harry Raymond, Lake Shore Drive and Waitham.
Frank P. Epps, S. E. Cor. 50th St. and Grand Boul.
Lieut. Barrett, 66th St. and Drexel.
F. J. Fadner, S. E. Cor. Magnolia and Leland.
C. F. Johnson, South Boulevard and Howard.
A. J. Pruitt, N.E. Cor. Leland and Kenmore.

LAWS, ORDINANCES AND REGULATIONS

RELATING TO THE

VENTILATION, LIGHT, DRAINAGE AND PLUMBING OF BUILDINGS.

STATE OF ILLINOIS—REVISED STATUTES.

JAN. 1, 1889. CHAPTER 24-1.

AN ACT

For the Regulation and Inspection of Tenement and Lodging Houses or Other Places of Habitation. Approved and in force May 30, 1881.

286. Section 1. **Architect—Plans.**—*Be it enacted by the People of the State of Illinois, represented in the General Assembly*, That it shall be the duty of any architect or architects, builder or builders of, or other person or persons interested in any projected tenement, lodging house or other places of habitation in any incorporated city of fifty thousand (50,000) inhabitants, to submit plans and specifications of any such building or buildings to the Health Commissioner or Commissioners of such incorporated city, that the said Health Commissioner or Commissioners may examine the said plans and specifications, for his or their approval or rejection as to the proposed plans for the ventilation of rooms, light and air shafts, windows, ventilation of water closets; drainage and plumbing.

287. Sec. 2. **Duty of Plumber.**—It shall be the duty of any plumber or other person or persons interested in the contract for the plumbing work of such building or buildings, to receive a written certificate of instruction from the Health Commissioner or Commissioners before commencing work on the said building or buildings, and to proceed according to the plans, specifications and instructions, as approved by the Health Commissioner or Commissioners of said city.

288. Sec. 3. **Health Commissioner—Notice.**—It shall be the duty of any plumber or other person or persons interested in the plumbing work, after the completion of said plumbing work, and before any of the said plumbing work is covered up in any building or buildings, or on the premises connected with said building or buildings, to notify in writing the Health Commissioner or Commissioners, that said building or buildings, or other premises, are now ready for inspection, and it shall be unlawful for any plumber, or other person or persons, to cover up or in any way conceal such plumbing work, in or about such building or buildings, until the Health Commissioner or Commissioners approve of the same.

289. Sec. 4. **Architect—Penalty.**—If any architect or architects, builder or builders, violate the provisions of this act, he or they shall be fined in a sum of not less than one hundred (100) dollars, nor more than two hundred (200) dollars for each offense.

290. Sec. 5. **Penalty—Plumber.**—If any plumber or other person or persons interested in the plumbing work, violate any of the provisions of this act, he or they shall be fined the sum of not less than one hundred (100) nor more than two hundred (200) dollars for the first offense, and the further penalty of ten (10) dollars for each and every day such plumber or other interested person or persons shall, after first conviction, neglect

or refuse to comply with any provisions of this act, or the written instructions of the Health Commissioner or Commissioners, and for the second offense a like penalty and a forfeiture of his or their license to do business in said city for one (1) year after conviction.

291. Sec. 6. **Emergency.**—Inasmuch as the health of the people is endangered, an emergency exists requiring this act to take effect immediately, therefore, this act shall take effect and be in force from and after its passage.

REGULATIONS AND CERTIFICATE OF INSTRUCTIONS.

In Force March 1, 1897.

GENERAL CONDITIONS.

Certificate. Owner or other interested parties should insist on receiving from the plumber a certificate of inspection, signed by the Chief Inspector and approved by the Commissioner of Health, showing that the plumbing work has been inspected as required by the city ordinance.

Plans. A duplicate of building plans must be filed with the Department of Health before the original is approved; said duplicate shall be on paper or cloth and drawn to a standard scale, and show all drain pipes within building.

Ventilation of Rooms. Every habitable room must have at least one window opening directly upon the street or yard, or upon a court or light shaft.

Light and Air Shaft. Every light and air shaft for habitable rooms must be at least twelve square feet in area for a three-story house, sixteen square feet in area for a four-story house, and twenty square feet in area for a five-story house; and in every case not less than two feet wide in the clear. Shafts between two houses, and common to both, must be of double this area and not less than four feet wide.

Where the sides of the shaft are allowed by the Department of Buildings to be constructed of studding, they shall be extended above the roof not less than three feet, be covered with glass to admit light, and be provided with openings protected by slats so arranged as to admit air, said opening to be at least equal in area to the area of the shaft.

Alterations and Additions.—No alterations in the light and ventilation of any buildings or approved plans shall be made, except upon the express written approval of the Commissioner of Health; nor shall any additional structure be erected upon the lot except upon such approval and a special permit.

Windows. The windows of habitable rooms which open on shafts shall be hung with weights so as to slide vertically, each window to be not less than twelve square feet in area.

SPECIAL NOTICE.

On and after June 1st, 1901, all re-vent pipes shall be cast iron, lead, or lead-lined wrought iron pipe, with recessed lead-lined fittings.

If cast iron is used it shall be extra heavy.

If lead is used it shall not be less than three-sixteenths of an inch in thickness, securely fastened to walls or partitions, and protected from punctures and rats by a suitable metal covering.

All connections between house drain and soil, waste or other pipes shall be made by a suitable metal connection, which shall make an air and water tight joint without the use of cement, mortar, putty or other like material.

Re-vent pipes shall be reconnected to main soil and waste pipes by a "Y" branch below the lowest fixture. This shall not apply where there is a battery of fixtures on one floor and no other fixtures on floors above or below; neither shall it apply where there is only one fixture on stack.

Sec. 856. Sewer Connections.—It shall be the duty of every person using, making or having any drain, soil-pipe or passage to connect with any sewer from any ground,

building, erection or place of business, and in like manner the duty of the owner and tenant of all grounds, buildings and erections, and of the parties interested in such place of business, or business therein, and in like manner the duty of all departments, officers and persons (to the extent of the right and authority of each) to cause and require that such drain, soil-pipe, passage and connection shall at all times be adequate for its purpose, and such as shall convey and allow freely and entirely to pass whatever enters or should enter the same, and that all connections between metal pipes and house drains shall be made by a plumber, in such manner as the Commissioner of Health may direct.

Every water closet located within the building shall waste into a pipe, not less than 4 inches in diameter; said pipe shall extend above the roof of main building.

Every sink or other plumbing fixture located within the building shall waste into a pipe not less than two (2) inches in diameter; said pipe shall extend above the roof of main building.

VENTILATION OF WATER CLOSETS.

Water-closets shall not be ventilated by a shaft which ventilates habitable rooms; and where they do not open otherwise to the external air, they must be ventilated by means of a separate shaft not less than ten (10) square feet in area, to extend above the roof, and to be arranged for the admission of light and air at the top, in like manner as the shafts for rooms.

The term "soil pipe" is applied to any vertical line of pipe, extending through roof, receiving the discharge of one or more water-closets, with or without other fixtures.

The term "waste pipe" is applied to any pipe, extending through roof, receiving the discharge from any fixtures except water-closets.

The term "vent or revent pipe" is applied to any special pipe provided to ventilate the system of piping and to prevent trap siphonage and back pressure.

All joints must be made with picked oakum and molten lead and be made gas-tight. Twelve (12) ounces of fine, soft pig lead must be used at each joint for each inch in the diameter of the pipe.

All wrought-iron and steel pipe must be equal in quality to "Standard," and be properly tested by the manufacturer. All pipe must be lap welded. No plain black pipe will be permitted.

Each building must be separately and independently connected with the public or a private sewer.

The entire plumbing and drainage system of every building must be entirely separate and independent of that of any other building.

Every building must have its sewer connections directly in front of the building unless permission is otherwise granted.

The use of pipe hooks for supporting drains is prohibited.

The house drain and its branches must be of extra heavy cast-iron, when underground, and of extra heavy cast iron, or galvanized, wrought iron or steel when above ground.

Ice box or refrigerator waste pipes shall extend above the roof.

Fittings for waste or soil pipes must be the special extra heavy cast-iron recessed and threaded drainage fittings, with smooth interior waterway and threads tapped, so as to give a uniform grade to branches of not less than $\frac{1}{4}$ of an inch per foot.

All joints to be screwed joints made up with red lead, and the burr formed in cutting must be carefully reamed out.

Outside leaders may be of sheet metal, but they must connect with the house drain by means of a cast-iron pipe extending vertically five feet above the grade level.

Cellar drains will be permitted only where they can be connected to a trap with a permanent water seal.

Subsoil drains should discharge into a sump or receiving tank, the contents of which must be lifted and discharged into the drainage system above the cellar bottom by some approved method.

Where directly sewer connected they must be cut off from the rest of the plumbing system by a brass flap valve on the inlet to the catch-basin and the trap on the drain from the catch-basin must be water supplied as required for cellar drains.

All pipe lines must be supported at the base on brick piers or by heavy iron hangers from the cellar ceiling beams and along the line by heavy iron hangers at intervals of not more than ten feet.

The house drain must properly connect with the house sewer at a point two feet outside of the outer wall of the building. An arched or other proper opening must be provided for the drain in the wall to prevent damage by settlement.

The house drain and sewer must be run as direct as possible, with a fall of at least one quarter inch per foot, all changes in direction made with proper fittings, and all connections made with Y branches and one-eighth and one-sixteenth bends.

If possible the house drain must be above the cellar floor. The house drain must be supported at intervals of ten feet by 8-inch brick piers or suspended from the floor beams or be otherwise properly supported by heavy iron pipe hangers at intervals of not more than ten feet.

Inside leaders (rain pipes) must be made of cast iron, galvanized wrought iron or steel, with roof connections made gas and water tight by means of a heavy lead or copper drawn tubing, wiped or soldered to a brass ferrule calked or screwed into the pipe.

Full size Y and T branch fittings for handhole clean-outs must be provided where required on house drain and its branches.

Clean-outs must not be less than four inches in diameter.

All urinals must be constructed of materials impervious to moisture that will not corrode under the action of urine. The floor and walls of the urinal apartments must be lined with similar non-absorbent and non-corrosive material.

The entire plumbing and drainage system within the building must be tested by the plumber in the presence of the plumbing inspector, under a water and air test as directed. All pipes must remain uncovered in every part until they have successfully passed the test. The plumber must securely close all openings as directed by the inspector of plumbing. The use of wooden plugs for this purpose is prohibited.

The water test will be applied by closing the lower end of the main house drain and filling the pipes to the highest opening above the roof with water. If the drain or any part of the system is to be tested separately, there must be a head of water at least six (6) feet above all parts of the work so tested, and special provision must be made for including all joints and connections in at least one test.

The air test will be applied with a force pump and mercury column under ten pounds pressure, equal to 20 inches of mercury. The use of spring gauges is prohibited.

After the completion of the work, when the water has been turned on and the traps filled, the plumber must make a peppermint test in the presence of a plumbing inspector and as directed by him.

The material and labor for tests must be furnished by the plumber. When the peppermint test is used, five ounces of oil of peppermint must be provided for each line up to five stories and basement in height, and for each additional five stories or fraction thereof one additional ounce of pepperment must be provided for each line.

Rubber connections shall not be used on any pipe or fixture which is connected with drain or sewer.

Double hubs shall not be used on soil, waste or vent pipes.

No house drain shall be less than six (6) inches, internal diameter.

ORDINANCE

Passed and in force November 30, 1891.

Be it ordained by the City Council of the City of Chicago:

Section 1. That in all buildings hereafter erected in the City of Chicago, and in all other buildings already built or erected, wherein the plumbing shall be repaired or changed, the drain, soil, waste pipes and traps must be exposed to view for ready inspection at all times and for convenience in repairing. When necessarily placed within partitions or in recesses they must be covered with woodwork, so fastened as to be read-

ily removed. In no case shall they be inaccessible, unless placed so in accordance with a written permit from the Commissioner of Health.

Sec. 2. Where sewer connections are not extended to the level of the floor line, foot connections of soil and waste pipes shall be made with one-quarter or one-eighth long iron bends, and an iron sewer cap, such as is in general use, shall be used to finish the construction. When sewer is extended to the floor line an iron sewer cap shall be used to complete the construction.

Sec. 3. Where water closets are placed outside of buildings, the Chief Inspector must be notified before work is started.

Sec. 4. No brick, sheet metal, earthenware or chimney flue shall be used for a sewer ventilator, or to ventilate any trap, soil or waste pipe.

Sec. 5. Every vertical soil and waste pipe must be of iron, and it must extend above the roof at least twelve inches, and have a diameter of at least one inch greater than that of the pipe proper. But in no case shall it be less than four inches in diameter through and above the roof. The increaser must be placed at least one foot below roof. No cap or cowl shall be affixed to top of such ventilation pipe.

Sec. 6. Soil, waste and vent pipes in an extension must be carried above the roof of main building when otherwise they would open within twenty feet of the windows, doors or ventilators of the main or adjoining buildings.

Sec. 7. Horizontal soil, waste and vent pipes are prohibited. Where rows of fixtures are placed in line, angle fittings must be used on vent pipes to prevent same from filling with rust or condensation. Trapped vents are strictly prohibited. No ventilation pipe from house side of any trap shall connect with any reventilation pipe or with any sewer, soil or waste pipe. Branches on main vertical vent pipes, where there is more than one fixture, must be taken out above the top of highest fixture.

Sec. 8. The least diameter of soil pipe permitted is four inches. A vertical waste pipe into which a line of kitchen sinks discharge must be at least three inches in diameter, if receiving the waste of five or more floors, and shall have two-inch branches.

Sec. 9. There shall be no traps at foot of soil or waste pipes.

Sec. 10. All iron pipes (cast) must be sound, free from holes or cracks, and of the grade known in commerce as extra heavy. The following weights per lineal foot will be accepted as complying with this ordinance:

2 inches,	5½	pounds	per	lineal foot.
3 inches,	9½	pounds	per	lineal foot.
4 inches,	13	pounds	per	lineal foot.
5 inches,	17	pounds	per	lineal foot.
6 inches,	20	pounds	per	lineal foot.
7 inches,	27	pounds	per	lineal foot.
8 inches,	33½	pounds	per	lineal foot.
10 inches,	45	pounds	per	lineal foot.
12 inches,	54	pounds	per	lineal foot.

Sec. 11. All fittings used in connection with such pipe shall correspond with it in weight and quality. Tar or asbestos coated pipe shall be used.

Sec. 12. When required by the Commissioner of Health, all work must be tested by such test as this department decides upon, and in the presence of the Inspector. Defective pipes must be removed and all defective work made good and to conform to this ordinance.

Sec. 13. All joints on (cast iron) soil, waste and drain pipes must be so filled with oakum and lead and hand-calked so as to make them air-tight.

Sec. 14. All connections of lead waste or vent pipes shall be made by means of wiped joints, and brass solder nipples or combination ferrules. Wrought or cast iron nipples or ferrules must not be used.

Sec. 15. Every water closet, urinal, sink, basin, bath, and every set of wash trays, tub or sets of tubs, must be effectively and separately trapped. When floor washes are connected it must be by means of a deep seal trap. Traps on bath tubs must be placed in such a manner that the clean-out will be in plain view and above the floor.

Sec. 16. The traps must be placed as near the fixture as possible, and in no case shall a trap be more than two feet from said fixtures

Sec. 17. In no case shall a waste from any fixture be connected with any water closet trap or revent connection for same.

Sec. 18. All traps must be protected from siphonage by special vent pipe. The vertical air pipe for traps of water closets in buildings more than four stories in height must be at least three inches in diameter, with two-inch branch for each water closet trap. This rule shall apply to all other fixtures except that branches may be same size as trap, and pipe may be reduced to two inches for two lower stories. Vent pipes for water closets in residences must be two inches, with same size branches, and for other fixtures not less than one and one-half inches, with branches same size as trap. All re-vents may be connected with increaser just below roof. (See Section 5.)

Sec. 19. No trap vent shall be used as a waste or soil pipe.

Sec. 20. All lead or other safes under fixtures must be drained by special pipe, same to discharge into sink or on cellar floor; and in no case shall the safe waste be connected with any waste, soil or drain pipe or sewer. The end of safe wastes shall be covered by flap valves.

Sec. 21. Overflow pipes from fixtures must be in each case connected on the inlet side of the trap.

Sec. 22. The drain pipe from refrigerator must not be directly connected with any soil or waste pipe, or with the drain or sewer, or discharge upon the ground; it must discharge into an open or water supplied sink. Such drain pipe must be so arranged as to admit of frequent flushing, and must be as short as possible and disconnected from refrigerator. The outlet should be covered by means of metal flap valve.

Sec. 23. The sediment pipe from boiler must be connected on inlet side of sink trap.

Sec. 24. Water closets must never be placed in an unventilated room or compartment. In every case the room or compartment must be open to the outer air or be ventilated by means of an air-duct or shaft. Interior water closets shall not be supplied from city supply pipes direct. All water closets within the house must be supplied from special tanks or cisterns, the water of which is not used for any other purpose. A group of water closets may be supplied from one tank, but water closets on different floors shall not be supplied from one tank. In tenement houses there must be a separate cistern for each water closet, excepting that in a cellar or unfinished basement the cistern may be dispensed with, and one water closet must be provided for each two families.

Sec. 25. The overflow pipes from water-closet cisterns may discharge into an open sink or where its discharge will attract attention and indicate that waste of water is occurring; but not directly into soil, waste, drain, vent or sewer pipe. When the city pressure is not sufficient to supply these cisterns adequate pumps must be provided.

Sec. 26. The valves or cisterns must be so fitted and adjusted as to prevent waste of water.

Sec. 27. Water closets when placed in a yard must be separately trapped and so arranged as to be conveniently and adequately flushed, and their water supply pipes and traps must be protected from freezing. The compartment for such water closets must be ventilated by means of slatted openings in the doors and roof.

Sec. 28. Tanks for drinking water, if indispensable, must not be lined with zinc or galvanized iron. They must be constructed of wood or iron or may be lined with planished copper. The overflow pipes shall discharge upon the roof or be trapped and discharge into an open sink; but never into any soil, waste pipe, water closet trap, drain or sewer. Discharge pipes from such tanks shall not be so constructed as to discharge into any sewer, connected soil or waste pipe.

Sec. 29. Rain water leaders shall not be used as soil, waste or vent pipes; nor shall any soil or vent pipe be used for a rain pipe. Where the leader opens near windows or light shaft it must be properly trapped far enough below surface to prevent freezing. The joint between leader and roof shall be air-tight. Sheet metal or slip joints shall not be allowed inside of any building.

Sec. 30. No steam, exhaust blow-off, or drip pipe shall connect with the sewer or with any house drain, soil or waste pipe. Such pipes shall be discharged into a tank or condenser from which a suitable outlet to the house drain shall be provided.

Sec. 31. Yards and areas shall be properly graded, cemented, flagged or well paved,

and properly drained. When the area drains are connected to the house drain they must be effectively trapped and protected by means of back-water valves.

Sec. 32. Cellar and foundation wall shall, where possible, be rendered impervious to dampness, and asphaltum or coal tar pitch in addition to hydraulic cement shall be used for that purpose.

Sec. 33. The general privy accommodations of a tenement house or lodging house shall not be permitted in the cellar, basement or under sidewalks.

Sec. 34. Wooden wash-trays and sinks are prohibited inside of any building; they shall be of non-absorbent material.

Sec. 35. No catch basins shall be allowed in any building.

Sec. 36. Where a single water closet or other plumbing fixture is located in a building and has an independent soil or waste pipe of undiminished size, from ground (in building) to roof, the revent may be dispensed with; *provided*, the trap of said fixture is located not more than five feet from the said soil or waste pipe, and that no other fixture on the floors above or below are connected or will be connected into any pipe from said single fixture. It is further provided that a non-siphoning trap, tested and approved by the Chief Inspector, shall be used for such work.

Sec. 37. Where two or more plumbing fixtures having an independent soil or waste pipe or undiminished size from ground in building to roof, are located on one floor, the revent pipe from the said fixtures may be branched into the soil or waste pipe, three feet above the floor on which the fixtures are located; *provided*, that no fixture or fixtures on the floors above or below are connected or will be connected into the soil, waste, vent or revents of the said fixtures. It is further provided that no fixture revented under this rule shall be more than eight feet from the main soil or waste pipe.

Sec. 38. Pan closets will not be allowed in any building.

Sec. 39. No privy vault will be allowed on premises where there is a main sewer in street. (See Sections 4956 and 4957.)

Sec. 40. Special permits will be issued by the Chief Inspector only. Where special permit is used the location must be inspected before work is started.

Sec. 41. The Commissioner of Health shall be notified in writing when work is ready for inspection.

Sec. 42. Any person or persons or corporation who shall violate any of the provisions of this ordinance shall, upon conviction, be subject to a fine not exceeding two hundred ($200) dollars, nor less than twenty-five ($25) dollars, for each offense, and a further penalty of not less than twenty-five ($25) dollars, for each day such violation shall be allowed or suffered to continue. And after the first fine shall have been imposed upon any person or persons having a plumber's license from the City of Chicago for any violation of any of the provisions of this ordinance, the Mayor may revoke the license of any such person or persons at once.

Sec. 43. That all ordinances or parts of ordinances conflicting with this ordinance be, and the same are hereby repealed.

Sec. 44. This ordinance shall take effect and be in force from and after its passage.

AN ORDINANCE REGULATING PRIVY VAULTS.

Passed June 25, 1894.

Sec. 4956. **Privy Vault, Unlawful Location of.**—*Be it ordained by the City Council of the City of Chicago:* §1. That it is hereby declared to be unlawful for any person, firm or corporation to maintain any privy vault or suffer the same to be and remain upon any premises abutting upon or adjoining any street, alley, court or public place, in which is located any public sewer. Any person, firm or corporation violating the provisions of this ordinance shall be fined not exceeding two hundred dollars for each offense.

Sec. 4957. **When in Force.**—§2. This ordinance shall take effect and be in force from and after its passage and due publication.

STEAM AND HOT WATER HEATING.

What methods shall be used is a question of moment.

For smaller buildings, say two or three stories, and residences, the basement circulating system is almost universally adopted, the steam for first floor being taken directly from the main, and risers run upward to radiators on floors above.

This can be done by either the one or two pipe system, and may have either wet or dry return; in the former the condensation is returned to the boiler below the water line, and in the latter it is returned above.

In the two pipe system the supply main is carried vertically above the top of the boiler to the ceiling of the basement and then in the direction of the radiators supplied, pitching from the boiler to the last branch taken off, where the main is relieved by a drip pipe connected to the nearest return below water line. Branch supplies are taken from main either from top of it or at an angle of 45 degrees. Any number of radiators may be supplied from a supply riser, but it is better to carry a return riser from each radiator to the return to basement, and make connections below the water line, otherwise the condensation from all radiators must lead through a single riser to the return.

It is necessary to use two valves for each radiator in this system, those controlling the admission of steam must close against the pressure, which will thus allow repairs being done while in use. Supply pipes should not be reduced too rapidly. Good results will be obtained if pipes are somewhat too large, but will be unsatisfactory when they are too small. In arranging pipes, care must be taken to properly adjust them, as when they are reduced in size, or sag, traps or pockets result and "hammering" will take place. In this system two valves are essential, and they must both be closed or open. When closing off steam the return valve must be closed first, and when turning steam on use the other valve first.

For hot water heating, the two pipe system has been found most satisfactory.

The one pipe system is more generally adopted, and especially for steam. In this a one main supply is carried to the ceiling of the basement, and thence around the basement at a slight decline and returned to the boiler above the water line, where it is dropped vertically and connected to the boiler at the return opening. At the highest point of the main the supply may be taken in opposite directions. Branches taken off must pitch upward from the main. In this system the supply pipe is not reduced as branches are taken off. In cases where the main is long an air vent should be put in the end of the main. If necessary to pitch a branch downward from the main it must be relieved at the lowest point. Larger pipe, permitting the flow of currents in opposite directions, should be used than in two pipe work.

The radiators should be lower at the end admitting steam so as to allow condensation to flow back freely.

It is important to hold pipes firmly in place with substantial hangers.

The modern practice of erecting heating plants either for steam or water is, for large buildings, the overhead system, i. e., the main supply pipe is taken direct from basement to attic, and a circulation pipe run around attic with drops to basement, so located that all radiators in building (except first floor) can be connected to them. These drop risers are connected in basement to return pipes and discharged into a receiving tank, or returned to boiler direct, according to the system used. In this system the first floor of building should be warmed by an independent system, i. e., a separate main in basement, to which radiators should be attached on first floor and a separate return pipe or a continuation of main as a circulator.

Air valves upon the radiators are important, whether automatic or not is a matter for the consideration of the user. The fact that the air must be exhausted from the radiators before the resultant heat will be present necessitates their use. If automatic, they must be properly adjusted, and in the case of dwellings some one should be instructed in their use.

As to the size of mains, Professor Carpenter says: "The area of the main pipe must in every case be equivalent in carrying capacity to that of all the branches taken off; it consequently may be reduced as the distance from the boiler becomes greater or as more branches are supplied. It will in general be found, except when large pipes are used, less expensive to run the main full size rather than to use reducing fittings."

The Model Heating Company says, find the area by multiplying the amount of radiating surface. If 1,400 feet or less, by .009; if 1,600 feet or more, by .008, and then use pipe with area nearest to that so found; thus radiating surface pipe will supply:

Diameter of Pipe.	Area in Inches.	——Radiation.—— Direct.	Indirect.
1¼ x 1	1.49	150	85
1½ x 1¼	2.03	225	140
2 x 1¼	3.35	350	200
2½ x 1½	4.78	500	300
3 x 2	7.38	800	500
3½ x 2	9.83	1100	700
4 x 2½	12.73	1500	1000
4½ x 2½	15.93	1800	1200
5 x 3	19.99	2400	1600
6 x 3½	28.88	3600	2200
7 x 4	38.73	5000	3000
8 x 4½	50.03	6500	4000
9 x 5	63.63	8000	5400
10 x 6	78.83	10000	7000

The same authority says: "In many cases where the water leaves the boiler and goes into the radiation, the trouble is caused by improper firing. If the water should disappear from the gauge glass, do not draw the fire, but cover it with wet ashes, and allow the boiler to cool before refilling with water."

PIPING FOR HOT WATER.

In the open tank system the basement piping consists of supply and return mains of the same size running parallel or with return directly under the flow pipes and pitching upward from the boiler. What is known as the trunk system consists of one supply and return main of equal size. These are run in pairs and each radiator has supply and return of same size.

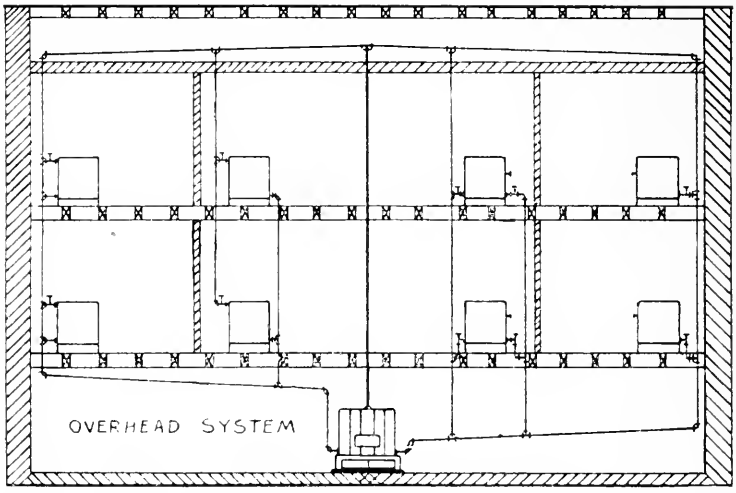
Each radiator has a valve and union ell at the opposite end of it. If one main only is used the radiators on first floor should be supplied direct and should have larger connections. Radiators on the second and upper floors can be supplied from one branch. The ends of supply and return should be larger than the supply riser.

In both hot water and steam it will be found economical to cover the basement mains and branches or they should be considered as radiating surface.

The Model Heater Company arrives at the size of mains by multiplying the radiating surface: When 1,800 feet and less, by .011; when 2,000 feet and over, by .009.

Size of Main.	Area.	Direct Radiation Will Supply, Feet.	Indirect Radiation Will Supply, Feet.
1½ inches	2.03	200	135
2 inches	3.35	325	200
2½ inches	4.78	450	300
3 inches	7.38	700	450
3½ inches	9.82	900	600
4 inches	12.73	1200	800
4½ inches	15.93	1500	1000
5 inches	19.99	2000	1200
6 inches	28.88	3000	2000
7 inches	38.73	4200	2800
8 inches	50.03	5600	3600
9 inches	63.63	7000	4600
10 inches	78.83	8500	5600

The cut shows four methods for overhead piping, the two to the left being for steam, the two to the right for water. An expansion tank is not shown, but it is necessary in the case of water being used, for as the temperature of water rises until at the boiling point it is 5 per cent. greater than at 40 degrees the increase must be provided for, so that when cooled the system will still be full of water. It should be placed at a point above the highest radiator, the supply and return to it being connected to the



supply and return of the nearest radiator, at a point below the radiator connection. No valves should be placed at any point that can possibly close the connection between the boiler and the tank.

To find the size of tank in gallons required, multiply the square feet of surface in the radiators, if the amount is less than 1,000 square feet, by .03; between 1,000 and 2,000 square feet., by .025; over 3,000 square feet, by .02.

An altitude gauge placed near the boiler will save watching the expansion tank. Fill the expansion tank to a point half way up the glass, and set the red hand of the gauge to indicate that point, and the movement of the movable hand will indicate the relative position of the water in the tank.

In the matter of radiation, the surface required is most important. In all cases the radiator should be placed as near the windows or outside exposures as possible. Low and curved window radiators add to the cost. Conditions vary considerably and must enter into the calculations of amount of radiation necessary. Glass exposure, wall expose, cubic contents, location, exposure and construction of building must all be taken into account. The Model Heating Company, whom we have before quoted, adopt the following method:

Ascertain the dimensions of room, the number of square feet of glass surface in windows and outside doors, figuring these doors as if glass, and measuring the entire opening of windows and door-frames. Ascertain the square feet of exposed wall surface, and deduct the glass surface as obtained above, and this will be the net amount of wall exposure. Reduce the wall surface to the equivalent of glass surface by dividing the net amount of wall exposure by 10 if the wall is from 8 to 10 inches thick, by 15 if from 12 to 26 inches thick, and by 20 if the wall is 26 to 38 inches thick. This result, added to the glass exposure, gives the glass equivalent of the glass and wall exposure. Multiply this glass equivalent by 75 (the cubic feet of air that each square foot of glass will cool per hour), and the product is the cubic feet of air to be heated to overcome the cooling effect of the glass and wall exposure. Now add to this the cubic contents of the room, and we have the total quantity of air to be heated.

It is customary to guarantee a temperature of 70 degrees in zero weather. To arrive at the amount of radiation under this guarantee multiply the quantity of air to be heated by the decimals given below, and the product will give number of feet required.

In localities where the temperature falls below zero, add to the amount of radiation obtained 1 per cent. for every degree below zero.

For Hot Water.—For temperature of water in radiators, 160 degrees, multiply by .0092; water in radiators, 170 degrees, multiply by .0081; water in radiators, 180 degrees, multiply by .0072.

For steam multiply by .0055.

For water use the multiple .0092; for if water is 175 degrees in flow and 145 degrees in return, the average is 160 degrees in radiation.

This is based upon using direct radiation, and provides for one change per hour. For more frequent changes increase the cubic contents by as many times as it is desired to change the air, the multipliers remain the same. The amount of radiation necessary for the several rooms will require some judgment as to their position.

Direct radiation is surrounded by warm air, but cold air comes in contact more or less with their surfaces, in direct-indirect and indirect systems, so that for direct-indirect add 25 per cent. and for indirect 50 per cent.

EXAMPLE FOR DIRECT RADIATION.

Room— 16 feet wide, 20 feet long, 10 feet high.
4 windows, 3 feet wide, 5 feet high.
2 sides of room exposed to 0° weather.
10 inches thickness of wall.
16 × 20 × 10 = 3200 cubic feet of air in room.
3 × 5 × 4 = 60 square feet of glass in windows.
16 + 20 × 10 = 360 square feet of wall surface exposed, including glass.
360 — 60 (glass) = 300 square feet actual amount of exposed wall surface.
300 ÷ 10 = 30 — glass equivalent in wall exposure.
30 + 60 × 75 = 6750 — air in cubic feet cooled by windows and walls.
3200 + 6750 = 9950 — total in cubic feet of air to be heated.
9950 × .0055 (multiplier for steam) = 54.72 radiation in square feet required to heat room.

Indirect radiation is adopted where a large amount of ventilation is desired. It is particularly necessary in schools, hospitals and churches, and in dwellings one or two indirect stacks are desirable. This method of heating is decidedly more expensive than all direct radiation, and consumes more coal. It is frequently used in combination with direct radiation, and in this case ventilating flues must be provided. Either fireplaces or special flues from each apartment so warmed to the open air, and these flues (as well as from those conducting heat) must be placed in inside walls or partitions.

In installing this system the heating stacks are placed in the basement, connected to main supply and return pipes and encased with either galvanized iron, or narrow ceiling lined with tin. The cold air is introduced through air ducts from the outside, and after being warmed by contact with the indirect heating surfaces, is introduced into the rooms through tin flues and registers.

It is a mistake to select a boiler of exactly sufficient capacity to carry the amount of radiation required to heat the building. The mains and risers must be considered radiating surface, and must be allowed for. The boiler should have a capacity of at least 20 per cent. in excess for direct work, for direct-indirect 25, and for indirect 50 per cent. The power of the boiler will be increased by covering the pipes in the basement.

A very essential adjunct to the working of a plant is the chimney flue, and the form of the flue has much to do with its effectiveness; thus as gases ascend in a spiral motion a round flue is the best, and a square one is better than one of rectangular shape. If of brick it should be evenly plastered. The flue should extend below the smoke pipe connection only a short distance to permit the removal of soot, if continued far below it will form an air pocket and cause down currents.

SIZES FOR CHIMNEYS.

Square Feet of Direct Steam Radiation.	Horse Power.	Size of Chimney.	Square Feet of Direct Water Radiation.
250	2.5	8 x 8	400
300	3.0	8 x 8	500
400	4.0	8 x 8	700
500	5.0	8 x 12	850
600	6.0	8 x 12	1000
700	7.0	8 x 12	1200
800	8.0	12 x 12	1350
900	9.0	12 x 12	1500
1000	10.0	12 x 12	1700
1200	12.0	12 x 12	2100
1400	14.0	12 x 16	2400
1600	16.0	12 x 16	2700
1800	18.0	12 x 16	3000
2000	20.0	12 x 16	3400
2200	22.0	16 x 16	3700
3000	30.0	16 x 16	5100
3500	35.0	16 x 20	5900
5000	50.0	16 x 20	8500
5500	55.0	20 x 20	9300
8000	80.0	20 x 20	13000

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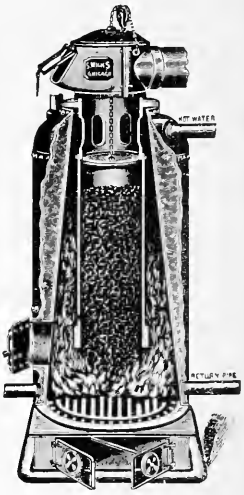

BEST IN USE,
ALL STEEL,
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CHICAGO.

SPECIFICATIONS AND ESTIMATES FURNISHED.

TELEPHONE WENTWORTH 1972.

IDEAL HEATING COMPANY,

ENGINEERS-CONTRACTORS,

STEAM AND HOT WATER HEATING AND VENTILATING APPARATUS.
STEAM POWER PLANTS.

414 WEST SIXTY-THIRD STREET,
CHICAGO.

For low-pressure heating purposes, which have been treated in this article, from four to six pounds of coal per hour are usually considered for each equare foot of grate surface in a boiler; for high-pressure, as high as ten pounds per hour for each square foot of grate.

The ventilation of rooms is a very important factor. A certain amount of space is necessary to provide change of air, the circulation of which is of more importance than is generally attached to it, in this respect the indirect system of heating is advocated.

In theaters, churches, etc., provision should be made to admit from 400 to 1,500 cubic feet of air per hour for each person. In school rooms children should be provided with 600 cubic feet, and grown persons 1,200 cubic feet of air per hour. The Massachusetts law requires 30 cubic feet of fresh air per minute for each pupil, or 1,800 cubic feet per hour. This requirement represents the most advanced American practice. From 2,000 to 3,000 cubic feet of air per hour per occupant is required in hospitals and workshops. Each cubic foot of gas burned for illumination will consume from 8 to 12 cubic feet of air per hour.

The low pressure gravity system is in general use where steam is installed for residences and small apartment buildings, and for large buildings where power for elevators, pumps, etc., is used, a system of reduced pressure steam, obtained by a reducing pressure valve or main adjusted to reduce the pressure for heating purposes from any high pressure that may be required for the engines, etc., to as low as even one-half pound. In this system all the exhaust steam is utilized for heating, and in many instances is sufficient. When there is a deficiency it may be supplied by the reduced pressure live steam. This is a very economical method of heating, as the steam practically costs nothing, and would go to waste if not so used, and the results obtained are the same as those from a gravity or vapor heating apparatus.

SOME OF THE REQUISITES FOR GOOD STEAM BOILERS.

(1) Best material for this purpose, simple construction, perfect workmanship.

(2) A mud-drum to receive impurities deposited from the water, in a place removed from action of fire.

(3) A steam and water capacity sufficient to prevent fluctuation in pressure or water level.

(4) A large water surface for the disengagement of the steam from water in order to prevent foaming.

(5) A constant and thorough circulation of water throughout the boiler, so as to maintain a uniform temperature.

(6) An excess of strength over any legitimate strain. No joints exposed to the direct action of fire.

(7) Combustion chamber so arranged that combustion of gases may be as complete as possible.

(8) The heating surface at right angles to the currents of heated gases.

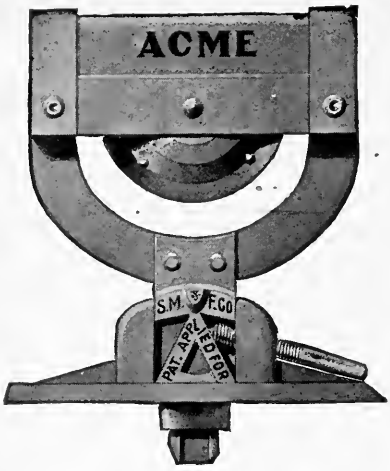
(9) All parts of the boiler readily accessible for cleaning and repairs.

(10) Very best gauges, safety valves and other fixtures.

The circulation of the air is of more importance than is generally attached to it, and the indirect system by means of which fresh heated air is introduced is to be advocated. Fire places are of great use for purposes of ventilation.

The temperature controlling apparatus, either for individual rooms or for the furnace, can be attached to steam, hot water or hot air heating systems with good results in economy of operation and comfort. For the control of the furnace, only a thermostat in one room and a steam pressure governor or hot water thermostat operating the fire and check drafts are usually used. For controlling individual rooms, a compressed air thermostat is placed in each, and a diaphragm valve on each radiator—if system is direct heating, or a damper in each duct if system is indirect or hot air.

Uniformity of temperature in rooms is everywhere being recognized as of the utmost importance, and in the construction of modern buildings much attention is being given to this subject. First, there is to be considered the comfort of the occupants of the rooms; and secondly, the economy attendant upon the use of a good system of regulation.



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CASES UNDER THE LAW FOR THE LICENSING OF ARCHITECTS.

ILLINOIS STATE BOARD OF EXAMINERS OF ARCHITECTS,

vs.

THE PEOPLE ex rel. FRED HARBERS.

Opinion by Higbee, P. J.

Appeal from Peoria.

This was a petition for a mandamus filed in the Circuit Court of Peoria County by the people, on the relation of Fred Harbers against the Illinois State Board of Examiners of Architects to compel said Board to issue the relator a license to practice architecture in this state. The relator avers in his petition that he is a resident of the City of Peoria and a citizen of this state of lawful age; that having selected the practice of architecture and building as his profession, he, to prepare himself, studied architecture in Germany in 1868 and 1869; that in 1873 he took up his residence in Peoria and in 1877 started in the business of architecture and building and continued in such practice up to September 1, 1897; that the act of June 3, 1897, entitled "An Act to provide for the licensing of architects and regulating the practice of architecture as a profession," provided for the appointment of a State Board of Examiners of Architects and also contained the following among other provisions, to-wit: "Any person who shall by affidavit show to the satisfaction of the State Board of Examiners of Architects that he or she was engaged in the practice of the profession of architecture on the date of the passage of this Act, shall be entitled to a license without examination: Provided, such application shall be made within six months after the passage of this act. Such license, when granted, shall set forth the fact that the person to whom the same was issued was practicing architecture in this state at the time of the passage of this act, and is therefore entitled to a license to practice architecture without an examination by the Board of Examiners, and the Secretary of the Board shall, upon the payment to him of a fee of twenty-five ($25) dollars, issue to the person named in said affidavit a license to practice architecture in this state in accordance with the provisions of this act"; that relator desiring to continue in the practice of said profession, on October 18, 1897, presented his affidavit showing he was engaged in the profession of architecture at the time of the passage of said act and tendered to said Board the fee of $25 and demanded that said Board issue to him a license to practice architecture in the State of Illinois; that said Board refused to issue him a license on the ground that he was engaged in business as a builder together with that of architecture; that the members of said board were influenced in refusing to issue a license by reason of the unfriendly feeling existing between relator and one of their members, who resided in Peoria; that the Board abused the powers vested in them for the purpose of crushing a rival of said member of the Board. The members of the Board were made parties defendant to the petition, and the prayer of the petition was "for the people's writ of mandamus directed to the said Board and each member thereof, commanding them forthwith to receive from the relator the fee of $25, which is hereby tendered, as required by law, and upon proof of affidavit of relator being presented to said Board, to issue relator a license in the usual form to practice architecture in the State of Illinois." Defendants in their answer denied that relator was engaged in the profession of architecture at the time of the passage of the act referred to in the petition or that he had ever practiced said profession either in the City of Peoria or elsewhere; denied that defendants were influenced by said member of the Board in refusing said license and any and all improper influences on the part of any one in the consideration of relator's application, and denied that relator is or ever was qualified to practice the profession of architecture or that he is entitled to a license under the law. They aver that he was a builder and contractor and not an architect. A replication was filed and a jury waived. Upon the trial the court found that the relator was at the time of the passage of the act in question a practicing architect; that he filed

his application and affidavit as required by law within six months after the passage of the act and was entitled to the writ of mandamus prayed for.

It was therefore adjudged by the Court "that the people's writ of mandamus issue in accordance with the prayer of said petition therefor, directing and commanding said Illinois State Board of Examiners of Architects and each member thereof to forthwith receive from the relator the fee of twenty-five dollars ($25) which has been heretofore tendered and to issue to the relator, Fred Harbers, a license in the usual form to practice the profession of architecture in the State of Illinois."

The question whether Harbers was at the time of the passage of the act in question engaged in the practice of the profession of architecture was vigorously contested. Apart from that question, which we do not pass upon here, there are reasons why we think the judgment was wrong. The law above referred to provides that "any person who shall by affidavit, show to the satisfaction of the State Board of Examiners of Architects, that he or she was engaged in the practice of architecture on the date of the passage of this act, shall be entitled to a license, without examination."

The prayer of the petition is that the writ of mandamus may issue "directed to the said board and each member thereof, commanding them forthwith to receive from the relator the fee of twenty-five ($25) which is hereby tendered as required by law, and upon proof or affidavit of relator being presented to said Board, to issue relator a license in the usual form, etc." The judgment does not follow the language of either the law or the petition, but directs the Board and each member thereof to receive the fee and to issue the license.

Under the judgment the relator is not required to furnish the Board with proof of his affidavit, as he himself proposed to do in his prayer for relief. The court does not find that he has presented such proof to the Board, and the finding that the statements of the affidavit are true cannot take the place of the presentation of the truth of the same to the Board. "The general rule that no specific relief can be granted except as prayed applies to mandamus proceedings." Spelling on Extraordinary Relief, page 1349, Sec. 1653. The relator did not ask that the Board be compelled to issue the license without proof of the affidavit, and the court could not rightfully go beyond the prayer of the petition and grant relief which was not sought.

It is also to be remarked that the prayer of the petition is not that the Board proceed to act upon the application, but that it act favorably thereon. There was no finding by the court that the Board was influenced in its decision to refuse the license by the rivalry and unfriendly feeling of the member referred to and thus abused its powers. In the language of the law a person desiring a license without an examination must "by affidavit show to the satisfaction of the State Board of Examiners of Architects that he or she was engaged in the practice of the profession of architecture on the date of the passage of this act." This certainly leaves some discretion to be exercised by the Board, and while a mandamus would lie in a proper case to compel the Board to act upon an application, yet in the absence of a wrongful abuse of power, amounting to a fraud against the rights of the applicant, it would not lie to compel its members to decide in a certain way.

In the People ex rel Sheppard vs. The Illinois State Board of Dental Examiners, 110 Ill. 180, it is said, "The office of the writ of mandamus is, in general, to compel the performance of mere ministerial acts prescribed by law. It lies, however, also to subordinate judicial tribunals, to compel them to act where it is their duty to act, but never to compel them to decide in a particular manner." It is the general rule that while abuse of discretion in a public officer or inferior tribunal may be controlled by mandamus, yet in the absence of such abuse, the writ will not lie to compel the performance of acts or duties which necessarily call for the exercise of judgment and discretion on the part of the officer or body at whose hands their performance is required. Illinois State Board of Dental Examiners vs. People ex rel Cooper, 123 Ill. 227. The People ex rel Damron vs. McCormick, 106 Ill. 184.

The court therefore erred in directing the Board of Examiners to receive the fee from the relator and pass favorably upon his application.

For the reasons above given, the judgment of the court below will be reversed and the cause remanded.

Reversed and remanded.

In the Matter of Stamping Plans.—Among the many important opinions rendered to the State Board of Examiners of Architects by its attorney, and which the Board has been following, which has a very far reaching influence throughout the community for the betterment of the profession of architects, is that which holds that it is a dishonest practice for a licensed architect to place his seal upon plans or specifications drawn by parties who are not his employes not licensed architects under the laws of this state.

The opinion was originally called for when complaint was made against an architect at Alton, Illinois, against whom it was charged that he was stamping plans and specifications for buildings to be erected in the State of Illinois, such plans and specifications having been drawn by architects residing in the City of St. Louis, State of Missouri, who were not entitled to practice architecture under the laws of the State of Illinois, the practice being to authenticate their plans and specifications by a licensed architect's seal

in order that they might be used in the construction of a building. Evidence was obtained which showed clearly that the plans were stamped for a consideration and the building erected thereunder.

Charges being filed, the Board called for the opinion, which, without reviewing the entire case, held that the stamping of the plans by a licensed architect for a consideration, he not having drawn the same, nor had any contract relations with the owner of the building to be erected, could only be for the purpose of permitting the building to be erected, and was an evasion of the law, and the man who evades, or by subterfuge attempts to evade the law, or the man who wilfully violates it, should be regarded as dishonest and his license revoked, because the purpose for which the law was instituted is thwarted and the law rendered nugatory.

The architect in this case assisted an unlicensed person to practice and to do an unlawful act. His action, therefore, was as dishonest as the party principal.

To this opinion was appended also the further opinion of the Honorable E. C. Akin, then Attorney General of the State of Illinois, to whom the attorney for the Board had also referred his opinion, who replied as follows:

"I am of the opinion the law providing for the licensing of architects does not contemplate that persons living in other states may be authorized to practice in this state by some licensed architect of this state simply stamping with his seal drawings and specifications prepared by such unauthorized person. Such a practice would render the law of no force, that kind of practice by a licensed architect is unprofessional and dishonest, for which his license may be revoked by the State Board of Examiners of Architects, as provided in the sections of the architects' law in question."

Since the rendering of this opinion the Board has taken up several cases of this character and has revoked two or three licenses for this cause.

CASES UNDER THE MECHANICS' LIEN LAW.

As this has already appeared several times in the issues of this book, it is well to give some important court decisions arising from it. These decisions should be most carefully read. Many important points affecting both architect and contractor are placed in a new light, and require thoughtful consideration.

Vol. 185, p 172, Illinois Supreme Court Records, Case of Freeman vs. Rinasker. Opinion filed April 17th, 1900.

1. **Mechanics' Liens.**—Nothing can be inferred in support of a mechanics' lien. One seeking to enforce a mechanics' lien must bring himself strictly within the terms of the statute since nothing can be inferred in his favor.

2. **Law Authorizes Mechanics' Lien for Services of Architect in Drawing Plans.**—Section 1 of the Mechanics' Lien Law of 1895: That any person who, by contract with the owner of a lot, shall prepare materials "for the purpose of or in building a house on such lot, or performing services as an architect for any such purpose" authorizes a lien in favor of the architect for services in preparing plans for a proposed building.

3. **Written Contract Must Contain Provision as to Time for Completing Work or Making Final Payment.**—Under Section 6 of the Mechanics' Lien Law of 1895, if the contract is in writing no lien can be had unless the contract provides for the time for completing the work, or for making final payment, since under such section, which is a substantial re-enactment of the act of 1845, a reasonable time can not be implied in the absence of a specified time.

4. **When Architect's Contract Is Not Sufficient Basis for Mechanics' Lien.**—An architect's written contract is not sufficient basis for a mechanics' lien when it contains no provision as to the time for completing the work, or for making final payment, and the provision for his compensation is a certain per cent. upon the cost of the building, but the cost is not specified and the building is not constructed.

Note.—The opinion in the case above referred to has been followed by the Appellate Court of the 3rd District in Vol. 91 App. Court Reports, p 74, case of Lamon vs. King Bros., opinion filed September 11th, 1900, where Court said, "Where a building contract is in writing and contains no provision as to the time in which the work is to be performed no lien can be enforced." The same theory covering a verbal contract has been decided in the 91st Vol. Ill. App. Court Reports, p 543, in case of M. J. Fitch Paper Company vs. McDonald, opinion filed November 8, 1900, as follows:

1. **Mechanics' Lien Under Verbal Contract—Time of Payment.**—"Under the Mechanics' Lien Law of 1895, when work is done or material furnished under a verbal contract no lien will attach, unless the work is to be done or the material furnished within one year from the date of the contract, and final payment is to be made thereon within such time."

2. **Under Written Contract.**—When a contract is in writing no lien will attach by virtue of the Act of 1895, when the time stipulated for the completion of the work, or furnishing of materials, is beyond three years from the date of the contract, or the payment beyond one year from the time stipulated for such completion."

3. **Terms of Contract to Govern.**—"It is immaterial, even if true, that it was within the contemplation of the parties that the work was to be completed and paid for within the time fixed by the statute. It is essential that the contract affirmatively specify a time for the completion of the work, or the furnishing of materials, which is within the period required by the statute."

1. **Mechanics' Lien—Subcontractors.**—One phase of the question as to who are subcontractors has been recently decided in the case of the Home Lumber Company vs. Disher in Vol. 91 Ill. App. Court Reports, 2nd District, p 629. In this decision it is practically held that under Section 5 of the Mechanics' Lien Law of 1895, it does not require the owner to demand a statement from the contractor as to those who become subcontractors more than 10 days after the contract for the building was made and who had not within said 10 days made bids or proposals to become said contractors.

2. **Who Cannot Take Advantage of a Failure to Demand a Statement as to Subcontractors.**—"One who first deals with the contractor more than 10 days after the contract for a building is made cannot take advantage of the failure of the owner to demand from the contractor a statement of the subcontractors within said 10 days." The facts were that the owners made a contract for the erection of the house. The owners never demanded a statement from the contractor nor did the contractor furnish the owner with a statement, nor was a bond given by the contractor at any time after the original contract was signed. Some time after 10 days had elapsed after the date of the signing of the original contract the Home Lumber Company furnished materials and became subcontractors and money was paid out, but, becoming involved, a number of mechanics' liens were filed, and the whole question taken before the Court, who decided that the Home Lumber Company could not take advantage of the fact that Section 5 and Section 23 had not been complied with, and that, therefore, under Section 33 payments made to the contractor were wrongful, the Court holding that they not being subcontractors within the period of time as required by the statute, could not take advantage of that fact and urge the points raised.

MECHANICS' LIEN—LANDLORD AND TENANT.

In the case of Brokaw vs. Tyler & Hippach, Ill. App. Court, May Term, 1900, Vol. 91, p 149, the Court has decided, "Where a landlord knowingly permits his tenant to put improvements upon the demised premises, the person who furnishes material or labor for such improvements will be entitled to a lien upon the premises under the statute." The facts in the above case were as follows: This was a bill for a mechanics' and materialman's lien upon real estate situated in the City of Bloomington to enforce payment of money due for improvements put upon property under contract with the tenant, who is in possession of the property under a lease from the owner, in which the tenant was forced to make improvements, but in the lease agreed to keep the owner clear of all liens on account of such improvements. The evidence shows that the owner had seen the materialman and contractor putting improvements upon his property but did not mention to them he was unwilling they should have a lien thereon, or had notified them of the condition of affairs, or that they must look to the tenant for their pay for same under the terms of the lease. The principal question determined by the Court was whether or not such a lien attaches to the interest of the owner of the property under the circumstances. The Circuit Court held that it did and the Appellate Court says they were correct in their decision. The Court said that by the terms of the lease the owner authorized his tenant to make the improvements and he knowingly permitted his tenant to make them, and the materialmen and contractors having, under these circumstances, put the improvements upon the owner's property under a contract with his tenant, have a right to the lien for the amount due them under the statute, as set forth in Section 1 of Lien Act.

The Court further said that the owner ought not to be permitted to avoid the materialman's lien under these circumstances, but must resort to his tenant for redress of any grievances he may have by reason thereof, under his agreement of the lease to keep him clear on account of such lien.

The same point decided in case of Carey-Lombard Lumber Co. vs. Jones, 187 Ill. Supreme, p 203; Henderson vs. Connelly, 123 Ill. p 98. Also in other states, etc., O'Leary vs. Roe, 45 Missouri App. p 567; Hall vs. Parker, 95 Pa. St. p 109; Burkett vs. Harper, 79 N. Y. p 273; Hill vs. Gill, 40 Minn. p 441.

ORDINANGE GOVERNING INSPECTION OF STEAM BOILERS.

1936. OFFICE OF INSPECTOR CREATED—TERM.)—There is hereby created the office of Inspector of Steam Boilers, who shall hold his office for the term of two years, and until his successor shall be appointed and qualified.

1937. Appointment.)—He shall be appointed by the Mayor, by and with the advice and consent of the City Council, on the first Monday in May, 1897, or as soon thereafter as may be, and biennially thereafter.

1938. QUALIFICATIONS —The person so appointed shall be a person well qualified from practical experience in the use and construction of boilers, generators and superheaters and their appurtenances, used for generating steam for power, steaming or heating purposes, to enable him to judge of their safety for use as such, and who is neither directly nor indirectly interested in the manufacturing, ownership or agency of steam boilers which are to be inspected.

1939. BOND.)—Said Inspector, before entering upon the duties of his office, shall execute a bond to the City of Chicago in the sum of five thousand dollars, with two or more sureties to be approved by the Mayor, conditioned for the faithful performance of the duties of his office.

1940. DUTY OF OWNERS.)—It shall be the duty of every person, firm or corporation owning, leasing or controlling the use of any steam boiler, tank, jacket kettle, generator or super-heater subject to steam pressure to have the same inspected by the Inspector of Boilers as often as once in each and every year, and to that end every person, firm or corporation owning, leasing or controlling the use of any such steam boiler, tank, jacket kettle, generator or super-heater shall make or cause to be made annually an application in writing to the Inspector requesting him to inspect the same. A failure to make such application within ten days from the date of the expiration of the last certificate and after due notice of such expiration having been sent by the Inspector, shall be deemed a violation of this section, and the party or parties guilty of such violation shall be subject to a fine of not less than twenty dollars nor more than one hundred dollars for each and every twenty-four hours the aforesaid party or parties may continue to use the said boiler or boilers, tank or tanks, jacket kettle or jacket kettles, generator or generators, after having been notified as aforesaid. Provided, however, that this ordinance shall not apply to boilers, generators or other apparatus used in private residences for generating steam solely for heating purposes; and for the purposes of this ordinance flat buildings or apartment buildings shall not be classed as private residences, and any steam boiler, generator or other apparatus used for generating steam in flat buildings or apartment buildings shall be subject to inspection as hereinbefore provided.

1941. DUTIES.)—It shall be the duty of the Inspector upon proper application to inspect all boilers, tanks, jacket kettles, generators, or upon proper application to inspect all boilers, tanks, jacket kettles, generators, or other apparatus used for generating steam for power, heating or steaming purposes, by making a careful examination of and subjecting the same to a hydrostatic pressure which shall exceed the maximum working pressure in the ratio of 150 to 100 pounds, and in no case shall the working pressure allowed be more than 104 pounds per square inch for a new boiler, 48 inches diameter, made of fringe steel plates of 60,000 pounds tensile strength, one-fourth of an inch in thickness in the thinnest plate, punched holes and single longitudinal seams, and 124 pounds per square inch for a new boiler 48 inches diameter, made of flange steel plates of 60,000 pounds tensile strength, one-fourth of an inch in thickness, in which all the rivet holes have been drilled and the longitudinal seams of the cylindrical parts double riveted. All boilers having thicker or thinner plates, larger or smaller diameters, shall be gov-

erned by the same standard of allowable pressures; provided, however, that whenever the plates of which any boiler is made show thereon the manufacturers' stamp indicating its quality, tensile strength and ductility, such boiler may be tested and rated in accordance with the United States Marine Inspection Law governing the inspection of steam boilers. But no boiler constructed of boiler plates after the passage of this ordinance shall have stay bolts of less than seven-eighths of an inch in diameter and pitched more than seven inches apart. All boiler heads made of boiler plate shall be braced with braces when sectional area shall be of not less than one inch diameter, so pitched that a greater strain than 6,000 pounds per square inch of section shall not be carried by any one brace. In computing the strain on braces in flat surfaces the diameter of brace rivets will be considered.

1942. CERTIFICATE—Record.)—When an inspection of a boiler or boilers, tank or tanks, jacket kettle or jacket kettles, generator or generators, super-heater or superheaters, has been made, and the same shall have been approved by the Inspector, said Inspector shall make and deliver to the person, firm or corporation for whom the inspection was made, upon payment to him of the fees hereinafter mentioned, a certificate of such inspection which shall contain the date of inspection, together with a general description for what purposes used, the number of try cocks, steam and water gauges, pumps, the pounds pressure to which said boilers have been tested and the maximum pressure at which they may be safely used; and the said certificate so issued shall be framed and put up in the office or in some other conspicuous place on the premises for examination, and a record of the same shall be made by the said Inspector in a well bound book and alphabetically indexed; and any person, firm or corporation owning, leasing or controlling the use of a steam boiler, tank, jacket kettle or generator, who is not in the possession of a certificate of inspection as aforesaid within thirty (30) days from the date of inspection, through or by reason of his or their neglect or refusal to pay the fees for said inspection, shall be subjected to the penalty heretofore provided in Section 2 for each and every twenty-four hours which shall elapse after the expiration of the thirty days aforesaid.

All certificates of inspection aforesaid shall be made upon blanks numbered consecutively, which shall be delivered to the said Inspector by the City Comptroller from time to time, upon said Inspector furnishing the Comptroller with the name of the person, firm or corporation for whom said inspection has been made and the location of the boiler or boilers so inspected.

1943. INSPECTION OF REPAIRS.)—It shall be the duty of said Inspector upon an application in writing made by any person, firm or corporation, owning, leasing or controlling the use of any boiler, tank, jacket kettle, generator or super-heater, stating that the same is out of repair or has been repaired, to examine the same when so repaired and determine if such repairing has been properly done; and it shall be unlawful for any person, firm or corporation to use any boiler, tank, jacket kettle, generator or super-heater after the same has been repaired until a certificate shall have been procured from the Inspector to the effect that such repairing has been properly done and such boiler, tank, jacket kettle, generator or super-heater may be safely used.

1944. FEES.)—Said Inspector shall be entitled to a fee of $5.00 for inspecting each boiler, tank, jacket kettle, generator or super-heater, which said fee shall be paid by the person, firm or corporation requiring such inspection to be made, before the delivery of the certificate of inspection. Provided, however, that in any establishment where more than one boiler is used, said Inspector shall be entitled to a fee of $5.00 for the first boiler, tank, jacket kettle, generator or super-heater inspected, and to a fee of $3.00 for each and every additional boiler, tank, jacket kettle, generator or superheater.

1945. CHARGING EXCESS OF FEE.)—If the Inspector shall take or receive any money or other valuable thing from any person other than the fees allowed by this ordinance, for the purpose of deceiving or defrauding any person or persons, or for the purpose of favoring any person or persons, or if said Inspector shall issue any certificate of inspection without having at the same time stated in said certificate thoroughly examined and tested the boiler, tank, jacket kettle, generator or super-heater so certified for, he shall be fined in the penal sum of one hundred ($100.00) dollars, and shall be removed from his office by the Mayor and shall ever be incompetent to hold the office of Boiler Inspector.

1946. TRY COCKS, GAUGES, FORCE PUMPS.)—It shall be the duty of every person, firm or corporation owning, leasing or controlling the use of any steam boiler, jacket kettle, generator or other apparatus, subject to inspection as hereinbefore provided, to provide and properly affix to each and every one of such boilers a full complement of try cocks, one water gauge, one steam gauge, one fusible plug of good Banca tin, properly inserted, one pop safety valve; the area of said pop valve shall be in the ratio of one square inch to three square feet of grate surface, and a lever or ball safety valve in the ratio of one square inch of area to two square feet of grate surface, and a suitable shut-off or main stop-valve so placed as to prevent the water from passing into the heating apparatus during the test made at the time of the inspection, and a good and sufficient force pump or other means of supplying the boiler with water. Also a good

and sufficient safety valve or reducing valve to all tanks or jacket kettles, properly attached. No stop or shutoff valve shall be placed between a boiler tank or jacket kettle and the safety valve.

1947. OWNERS TO PROVIDE FACILITIES.)—All owners, agents or other persons using steam boilers, tanks, jacket kettles, generators or super-heaters, subject to inspection as aforesaid, shall provide at their own expense such arrangements and facilities for attaching the instruments of inspection as the Inspector shall direct.

1948. ENGINEER'S NEGLIGENCE.)—Any engineer or other person in charge of a steam boiler or generator who shall negligently or wrongfully endanger the life of any person by permitting the water to fall below three inches above the flues or crown sheet of any boiler, or shall disturb the weight on the safety valve, or tamper with it so as to carry more pressure than allowed by the Inspector; or who shall otherwise neglect his duties, shall be subject to a fine of not less than $25.00 nor more than $100.00.

1949. SAFETY VALVES.)—The safety valves of steam boiler or other apparatus subject to inspection under this ordinance as aforesaid, shall be loaded to sustain only the maximum pressure allowed by said Inspector.

1949½. MANUFACTURERS AND DEALERS—NOTIFY INSPECTOR.)—Any person, company or agent manufacturing, dealing in, selling or erecting steam boilers, tanks or jacket kettles subject to inspection under the ordinance, shall on the sale or delivery of such steam boiler, tank or jacket kettle, or generator at any point or locality within the city, the intent of so doing being that such boilers, tanks, jacket kettles or generators shall be used under steam pressure, shall upon such sale or delivery as aforesaid notify the Inspector, giving the name of the owner, name of maker, number and name of the street or otherwise designate the locality of said delivery or sale. Give also the thickness and quality of the material used in construction and the brand stamped on the plate.

1950. PENALTY.)—Any person or persons who shall violate any of the provisions of this ordinance where no other penalty is provided, shall be subject to a penalty of not less than $25.00 nor more than $100.00 for each and every offense.

1951. MONTHLY REPORT.)—The Inspector of Steam Boilers of the City of Chicago shall make to the Comptroller on or before the tenth day of each month, a report in writing, verified by affidavit, showing in detail the fees and charges collected by him and the salaries and expenses paid by him in the preceding month, and at the same time shall pay into the City Treasury, after deducting the salaries and expenses paid by him, one-half of all such fees and charges so collected by him for the use of the said City of Chicago, and one-half of all such fees and charges so collected by him shall be retained by him as and for his salary.

1952. APPARATUS.)—The City of Chicago shall provide such instruments, books, papers and things as shall be necessary for the proper performance of the duties of such inspector, which shall be the property of said city, and which shall be delivered by said Inspector to his successor in office, or to the Commissioner of Public Works, whenever he shall cease for any cause to discharge the duties of said office; said Inspector shall also, without expense or charge, inspect all boilers owned or used by the city, or any of its departments, whenever called upon by the proper officers. He shall also report to the City Council every three months, or as often as once a month, if required by said Council, all inspection of boilers by him made.

AN ORDINANCE

Creating a Board of Examiners of Plumbers, and providing for the examination and certification of plumbers.

Passed and in force January 31, 1898.

Be it ordained by the City Council of the City of Chicago:

Section 1. That any person now engaged in, or hereafter engaging in, or working at, the business of plumbing in the City of Chicago, either as master plumber or employing plumber, or as a journeyman plumber, shall obtain a certificate as to his or her competency to engage in such business in such manner as is hereinafter provided.

Sec. 2. Any person now engaged in the business of plumbing, or who may desire to engage in such business, either as a master plumber or employing plumber, or as a journeyman plumber, shall make application to the Board of Examiners, hereinafter provided for, and shall, at such time and place as said Board may designate, undergo such examination as to his qualifications and competency to engage in such business, or to continue to engage in such business, as the said Board of Examiners may direct. Said examination may be made, in whole or in part, in writing, and shall be of a practical and elementary character, sufficiently strict, however, to test the qualifications of the applicant.

Sec. 3. There is hereby created a Board of Examiners of Plumbers, consisting of three (3) members, one of whom shall be the Commissioner of Health, who shall be (ex-officio) chairman of said Board of Examiners, a second member who shall be a master plumber, and a third member who shall be a journeyman plumber. Said second and third members shall be appointed by the Mayor, by and with the advice and consent of the City Council, as soon as may be after the passage and approval of this ordinance, and the said two members first appointed shall hold office until the first day of May, 1899, and thereafter the second and third members to be appointed on said Board of Examiners shall be appointed by the Mayor, by and with the advice and consent of the Council, on the first day in May, 1899, and annually thereafter. Each of said second and third members so appointed shall, before entering upon the duties of their office, execute a bond to the City of Chicago, in the sum of $5,000, with sureties to be approved by the City Council, conditioned for the faithful performance of the duties of the office to which they have been appointed. The salary to be paid to each of the second and third members of the Board of Examiners shall be $1,500 per year.

Sec. 4. As soon as may be after the passage and approval of this ordinance, the Mayor shall appoint, by and with the advice and consent of the City Council, a Secretary to said Board of Examiners, and it shall be the duty of said Secretary to preserve and keep all records, books and papers which are required by law to be kept by, or filed with, said Board, and to do and perform such other services as may be from time to time required by the said Board of Examiners. The person first appointed Secretary shall hold office until the first Monday in May, 1899, and thereafter the Secretary to said Board of Examiners shall be appointed by the Mayor, by and with the advice and consent of the City Council, on the first Monday in May, 1899, and biennially thereafter. The person appointed Secretary shall, before entering upon the duties of his office, execute a bond to the City of Chicago, in the penal sum of $5,000, with sureties to be approved by the City Council, conditioned for the faithful performance of the duties of his office. The salary to be paid said Secretary shall be $1,500 per year.

Sec. 5. Said Board of Examiners shall, as soon as may be after appointment, meet at such time and place as the Commissioner of Health may designate, and proceed to carry out the provisions of this ordinance. Said Board shall examine applicants as to their practical knowledge of plumbing, house drainage and plumbing ventilation; and if satisfied as to the competency of any such applicant, and upon receipt of the fee hereinafter provided for, shall issue a certificate to such applicant, authorizing him to engage in or work at the business of plumbing, either as master plumber or employing plumber, or as a journeyman plumber, as the case may be, and according to the terms of the application made by such applicant. Provided, however, that the issuance of the certificate and the payment of the examination fee, as herein provided, shall not entitle any master plumber or employing plumber to whom such certificate is issued, to engage in the business of master plumber or employing plumber in the City of Chicago until such master plumber or employing plumber has obtained a license so to do, in accordance with the provisions of Section 1415, Article 1 of Chapter 50 of the Revised Code of Chicago, 1897. The fee for the examination and certificate of a master plumber or employing plumber shall be five ($5) dollars, in addition to the sum charged for a license fee as provided for in Section 1415, Revised Code, as aforesaid, and for the examination and certificate of a journeyman plumber it shall be one ($1) dollar. All fees received for said examinations and certificates shall be paid into the City Treasury.

Sec. 6. The Commissioner of Health is hereby authorized to provide office room for

the Secretary of said Board of Examiners in the offices of the Department of Health; and all records of the said Board of Examiners shall be considered and become a part of the records of the said Department of Health.

Sec. 7. The certificate herein prescribed for master plumbers shall be accepted in lieu of the examination provided for in Sections 1417, 1418, of the Revised Code of Chicago, 1897, which said section is hereby repealed in so far as it is inconsistent or in conflict with the provisions of this ordinance; but all other existing ordinances and sections of ordinances relating to plumbers and plumbing shall continue to be operative and in force, unaffected by the passage of this ordinance.

Sec. 8. Any person violating, disobeying, neglecting or refusing to comply with any of the provisions of this ordinance, shall be subject, on conviction thereof, to a penalty of not less than $5 nor more than $50 for each offense, and, upon such conviction, the certificate issued as herein provided may be revoked by the Mayor, on recommendation of the Commissioner of Health.

Sec. 9. All ordinances or parts of ordinances in conflict herewith are hereby repealed, and the ordinance passed by the City Council on December 13, 1897, as published on pages 1135, 1136 and 1137 of Council Proceedings, 1897, is hereby specifically repealed.

Sec. 10. This ordinance shall be in force and take effect from and after its passage and publication.

AN ACT

Creating the Office of Supervising Architect of the State of Illinois, and Defining His Powers and Duties.

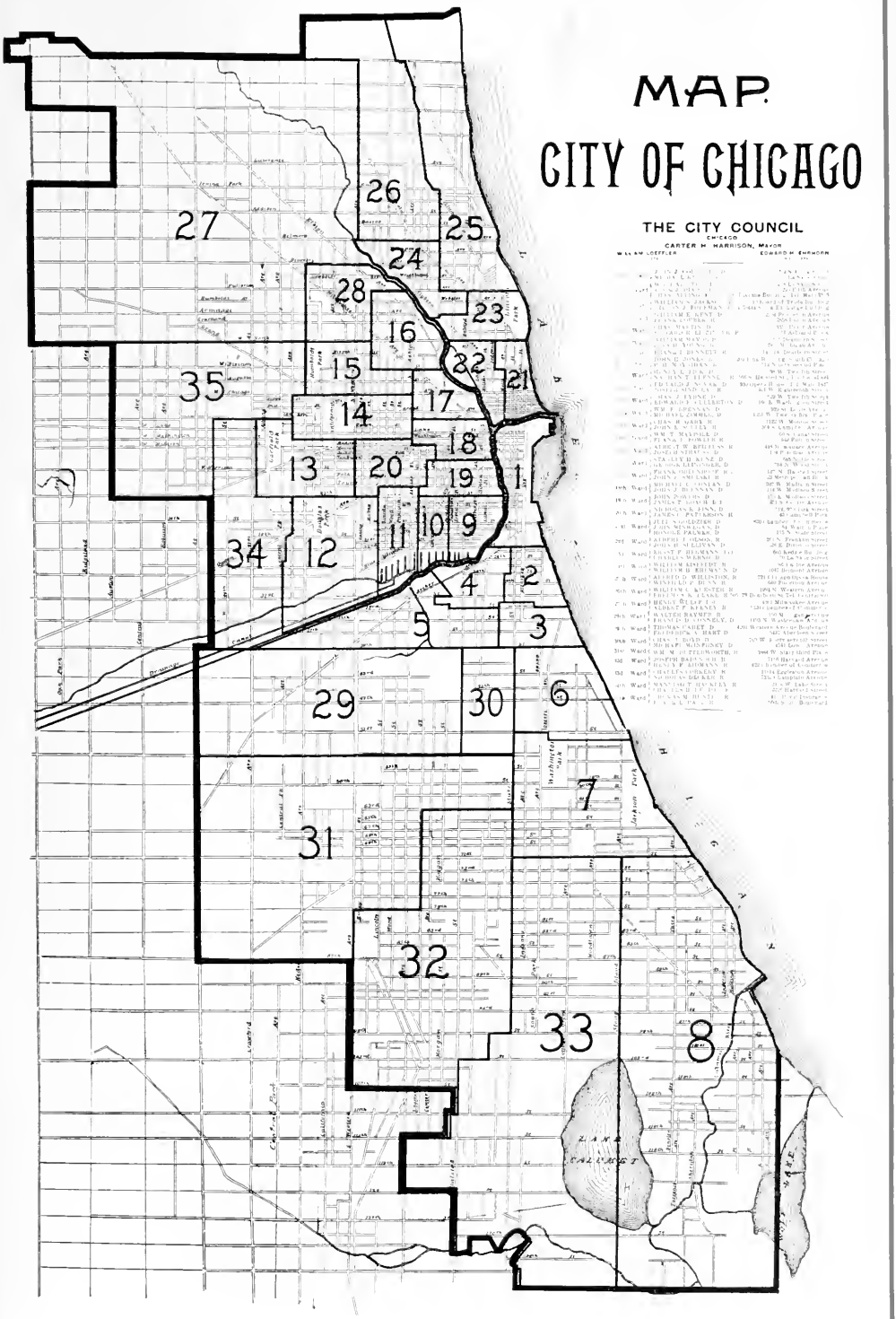
1. That it shall be the duty of the Governor, with the advice and consent of the Senate, to appoint a State architect of public buildings and improvements who shall hold his office for a term of four years.

2. The compensation of such State architect shall be five thousand dollars per annum, and the Auditor of Public Accounts is hereby authorized and directed to issue his warrants on the treasury in favor of such State architect for the amount specified in this section, and the State Treasurer is hereby authorized and directed to pay said warrants out of any money in the treasury not otherwise appropriated.

3. Such State architect is hereby authorized and empowered and it shall be his duty to make and provide all drawings, plans, specifications and models for the erection of all public buildings and improvements of the State, including additions, alterations and repairs to buildings already erected, and including, also, the construction and perfection of all systems of sewerage, drainage, ventilation, steam heating, plumbing, electric lighting and works for the water supply pertaining thereto; and including also, the improvement of all grounds, upon which such buildings are to be erected, all of which said drawings, plans, specifications and models shall be submitted to the Governor for his approval. Such State architect shall have general supervision over the erection and construction of all public buildings and works of the State and also over the inspection of all materials previous to their incorporation into such buildings or works. He shall see that such public work or building, as a whole or in parts, is prosecuted with diligence and in a proper and workmanlike manner; and if satisfied that such work is being slighted, inferior materials being used or any other fraud is being practiced by any contractor, whereby the interests of the State may be injuriously affected, he shall report the same to the proper officer, commissioner or board, in order that such officer, commissioner or board may, in his or their discretion, annul all contracts with any contractor. Such State architect is hereby given the power of defining the true intent and meaning of all drawings, plans and specifications; and he shall have authority to stop the progress of the work thereunder and order its removal when not in accordance therewith. It shall be the duty of such State architect, upon the written request of the proper officer, commissioner or board to do and perform any and all things in this section mentioned and enumerated as herein provided.

4. All drawings, plans, specifications, models and estimates, and all papers incidental to the erection and construction of public buildings shall be the property of the State; and should the architect be removed, or from any cause cease to act, he shall deliver up to the proper officer, board or commissioner all plans, specifications, drawings, books, papers and effects in his possession belonging to the State; and if he fails or refuses to deliver the same, or any of them, upon demand, they may be recovered in a civil action, and he shall be liable upon his official bond for their value, and all damages resulting by reason of their detention.

5. The architect appointed under this act, before entering upon his duties, shall take and subscribe an oath of office, and shall give a good and sufficient bond in the sum of ten thousand dollars, with two or more sureties, residents of this State, who are not and shall not become interested, directly or indirectly, in any public works; which bond shall be conditioned for the honest and faithful performance of his duties as such architect, and the exercise of care and skill in the discharge thereof; which bond shall be approved, recorded and filed with his official oath, according to law.


MAP
CITY OF CHICAGO
THE CITY COUNCIL
CHICAGO
CARTER H. HARRISON, MAYOR
WILLIAM LOEFFLER
EDWARD H. EHMORN
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Municipal Art League of Chicago.

OFFICE, 1112 CHAMBER OF COMMERCE.

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FOR finishing front doors and all classes of housework exposed to the weather, where **greatest durability** is requisite. Dries free from Dust in ten to twelve hours, and hardens sufficiently in about five days to admit of being rubbed. Possesses the **maximum elasticity** attainable in any finish or varnish. Produces a beautiful lustre over natural, painted or grained woods which may be cut down with pumice stone and water to a dull finish. **Does not scratch or mar white, and resists atmospheric influences better than any varnish or finish in use for the purpose.**

In 5 gallon cans,	- - -	$3 40 per gallon
In 1 " "	- - -	3 50 " "
In ½ " "	- - -	1 85 each.
In ¼ " "	- - -	95 "
In ⅛ " "	- - -	55 "

PACKAGES FREE

ROSENBERG'S TRADE ELASTICA MARK FINISH No. 2

FOR INTERIOR WORK

ESPECIALLY adapted for hallways, bath rooms, dining rooms, kitchens, bar fixtures and general inside house work, requiring a finish of **extreme durability.** Produces a beautiful lustre over natural, painted or grained woods, and by cutting down with pumice stone and water, a **smooth, dull** finish is obtained. Dries free from dust in seven to nine hours, and hardens sufficiently to admit of being rubbed in about three days. Is very **elastic, and will not scratch or mar white.**

In 5 gallon cans,	- - -	$2 40 per gallon
In 1 " "	- - -	2 50 " "
In ½ " "	- - -	1 35 each.
In ¼ " "	- - -	70 "
In ⅛ " "	- - -	40 "

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POINTS ON VARNISH.

By Herman Rosenberg.

DRYING AND HARDENING.—Proper light and ventilation are absolutely necessary to facilitate drying and hardening. Varnish applied in buildings that are damp and not properly heated in cold weather, will be considerably retarded in drying and hardening. Extremely hot weather will also keep varnish soft for quite a time. The best results are obtained at a temperature of 70 to 75 degrees Fahrenheit.

TURNING WHITE.—It is caused by the action of water and dampness. The more elastic the varnish, the better it will resist this action, whereas, cheap, brittle, quick-drying varnishes are very easily affected.

BRITTLENESS.—Is an inherent defect in the varnish caused by an excess of dryer, lack of oil, or by adulterated materials having been used in its manufacture. If a varnish powders white under friction of the finger or easily scratches white, that is incontrovertible evidence of its poor quality. Brittle varnishes should not be used even for the undercoats, as they destroy the toughness and durability of the finish, despite its being protected with an elastic, durable finishing varnish. It is poor economy, in any event, to use brittle varnishes, as the cost of application, which is the main expense, is the same as if good material were employed.

CHILLING.—As its name implies, is caused by exposure to cold weather. Varnish should never be used while in this condition. To remedy is to keep the chilled varnish in a warm room, until it has been restored to its normal condition. Long exposure to cold weather may also cause the varnish to become "specky" and "seedy," in which event it is necessary to keep it near a steam pipe or warm stove for some time, until the chilled particles have disappeared.

CRACKING.—Cracking is caused by the under coats not having been dry when the finishing coat was applied, or when abnormally heavy coats have been used, especially for the undercoats. Brittle varnishes are liable to crack when exposed to sudden changes of temperature.

BLOOMING OR GOING FOGGY.—Is caused by exposure to dampness, moisture or gases, AFTER the varnish has become hard. The more elastic the varnish, the less liable it is to "bloom" or become "foggy."

WRINKLING, CRAWLING, CRAMPING OR SAGGING.—Is caused by applying the varnish too heavily or by exposure to sudden changes of temperature while in the process of drying, or if the undercoats are not dry when the finishing coat is applied.

DEADENING OR SINKING AWAY.—Caused by the undercoats not having been allowed sufficient time to dry, causing the finishing coat to become absorbed while in the course of hardening. Insufficient foundation coats will also cause the finishing to sink away.

BLISTERING.—Is caused by the action of heat, especially from the concentrated rays of the sun, if sap or dampness is retained in the wood, or if moisture exists in the undercoats when the finishing coat is applied.

PITTING.—Is caused by applying varnish over an oily or damp surface; also, if the varnisher is not careful to thoroughly incorporate the turpentine in reducing the varnish, or uses improper thinning material.

KNOTS AND SAPPY WOODS.—The sap and knots should be "killed" by the use of grain or wood alcohol shellac for the first coat. If this is not done, the sap will work through and injure the finish.

THINNING.—When found necessary, should be done with spirits of turpentine. In order to insure proper amalgamation, neither the varnish nor the turpentine should be too cold when mixing. The warmer the varnish and turpentine, the quicker the amalgamation. After reducing the varnish, allow it to stand awhile before using. Oil, Japan or liquid dryer should NEVER be added to varnish.

SWEATING.—Is caused by rubbing the undercoat before it is thoroughly dry.

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Illuminated Dial Voltmeters	W 38	Knife Switches	W 21
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Switchboards		Automobile Charging Outfits	W 36
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WAGNER ELECTRIC MFG. CO., 1624 MARQUETTE BUILDING, CHICAGO.

No. 207.

DEPARTMENT OF ELECTRICITY,

City of Chicago.

NOTICE.

Particular attention is called to the different sections of the ordinance herein printed:

Permit must be obtained before any work is done.

The use of electric current is prohibited previous to certificate being issued.

Conditions unsafe to life or property must be corrected within forty-eight hours.

Each building must have independent service from street or alley.

Wires must not pass through party walls, over roofs or under sidewalks.

Current must not be supplied from trolley lines for motors or light except for power stations owned by company.

Temporary work must be inspected and approved before current is used.

Alterations to existing wiring must not be made without regular permit.

Permits issued by the Commissioner of Public Works for electrical work to be done on streets must be countersigned by the Department of Electricity.

Violation of any of the Sections of this ordinance constitutes a misdemeanor and renders any person, firm or corporation liable to arrest and fine of not less than $50 or more than $100, also the cutting off and stopping of current used in violation until the provisions are complied with.

In the drawing of specifications for electrical work it is the duty of architects to require the contractors accepting work under the specifications to furnish a certificate of inspection from the Department of Electricity, City of Chicago, covering their work, which in itself assures that the work has been done according to the rules and regulations of the department.

Edward B. Elliott

City Electrician.

GENERAL SUGGESTIONS.

In all electric work conductors, however well insulated, should always be treated as bare, to the end that under no conditions, existing or likely to exist, can a grounding or short circuit occur, and so that all leakage from conductor to conductor, or between conductor and ground, may be reduced to the minimum.

In all wiring special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors and securing and attaching of fittings, are especially conducive to security and efficiency, and will be strongly insisted on.

In laying out an installation, except for constant-current systems, the work should, if possible, be started from a center of distribution, and the switches and cutouts, controlling and connected with the several branches, be grouped together in a safe and easily accessible place, where they can be readily got at for attention or repairs. The load should be divided as evenly as possible among the branches, and all complicated and unnecessary wiring avoided.

The use of the wire-ways for rendering concealed wiring permanently accessible is most heartily indorsed and recommended; and this method of accessible concealed construction is advised for general use.

Architects are urged, when drawing plans and specifications, to make provision for the channeling and pocketing of buildings for electric light or power wires, and in speci-

W. H. RATTENBURY, President. R. D. JONES, Vice-President. ARTHUR FRANTZEN, E. E. M. A. I. E. E., Sec'y and Treas.

Arthur Frantzen Company,

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Telephone Central 1630.

fications for electric gas lighting to require a two-wire circuit, whether the building is to be wired for electric lighting or not, so that no part of the gas fixtures or gas piping be allowed to be used for the gas-lighting circuit.

SPECIAL NOTICE.

Place all service switches, meters and cut-outs, when practicable, in basements or public places where they will be readily accessible to inspectors, meter readers and trouble men, in order to obviate the necessity of interfering with tenants of apartments. It often occurs that tenants of apartment buildings who are not using electric current are annoyed by the visits of inspectors and trouble men in their necessary duties in making inspections or repairs for other tenants.

The placing of meters in basements or halls will largely do away with the annoyance caused by their disagreeable humming and it will be much more satisfactory to all concerned.

SECTIONS OE THE REVISED CODE OF THE CITY OF CHICAGO, GOVERNING ELECTRICAL INSPECTIONS.

January 1, 1899.

CHAPTER XXV.—DEPARTMENT OF ELECTRICITY.

596. **Electric Current.**—No electric current shall be used for illumination, decoration, power or heating, except as hereinafter provided.

597. **Application—Contents—Permits.**—All persons, firms or corporations desiring to install wires or other apparatus for the use of electric currents for any of the purposes mentioned in the preceding section of this chapter shall, before commencing or doing any electrical construction work of any kind whatever, either installing new electrical apparatus or repairing apparatus already in use, file an application for a permit therefor in the office of the City Electrician, which application shall describe in detail such material and apparatus as it is desired to use, with a full description of the same, giving the locality by street and number; and upon receipt of which application, if found proper, such permit shall be given.

598. **Duties of City Electrician Thereon.**—The said City Electrician shall then have power, and it shall be his duty, when by him deemed necessary, to carefully inspect any such installation previous to and after its completion, and it shall be competent for him to remove any existing obstructions which may prevent a perfect inspection of the current carrying conductors, such as laths, plastering, boarding or partitions; and if such installation shall prove to have been constructed in accordance with the rules and requirements of the fire department of the City of Chicago, controlling the use of electric current, upon the payment of a fee, as herein provided, he shall issue a certificate of such inspection, which shall contain a general description of the installation and the date of said inspection. The use of electric current is hereby declared to be unlawful previous to the issuance of said certificate: provided, however, the City Electrician may issue a temporary permit for the use of electrical current during the course of construction or alteration of buildings, which permit shall expire when the electrical apparatus for such building is fully installed.

598a. **Preliminary and Final Certificate.**—A preliminary certificate may be issued by said City Electrician, in the case of completed installations, but upon which no current will be used in the immediate future. Such preliminary certificate shall show that at the date of inspection the installation was erected in accordance with the terms of this chapter, and shall be issued at one-half the rates hereinafter named. Prior to the intro-

duction of electric current into the said premises a second inspection shall be made, when if the said installation is still in accordance with the terms of this chapter, a complete and final certificate shall issue, and the amount of the fee paid for the preliminary certificate shall be deducted from the fee for the final certificate. Any owner or owners of property installing electric wires to be hidden from view shall, prior to such installation, give said City Electrician a reasonable notice in order to give ample time for inspection.

598b. **Power of City Electrician — Inspections and Re-inspections.** — The said City Electrician is hereby empowered to inspect or re-inspect all overhead, underground and interior wires and apparatus conducting electric current for light, heat or power, and when said conductors or apparatus are found to be unsafe to life or property, shall notify the person or persons, firms or corporations owning, using or operating them to place the same in a safe and secure condition within forty-eight hours. Any person, firm or corporation failing or refusing to repair, change or remove the same within forty-eight hours after the receipt of such notice, shall be subject to the penalty hereinafter provided.

598c. **Poles Covers Wires—Electric Service Entrances—Switches.**—All poles now standing or hereafter erected, and all covers for manholes now in service, or hereafter placed in service for the use of electric conductors, shall be branded or stamped with the name of the person, firm or corporation owning the same; all electric service entrances shall have attached to the conductor or conductors, in a conspicuous place, a substantial tag designating the owner of, and giving such a full description of the conductors as shall meet with the approval of said City Electrician; and all of said electric service entrances shall be properly equipped with approved cut-out service switches. Each building into which electric current shall hereafter be introduced shall have independent service from the street or alley, entering at right angles with the street curb; and no wires hereafter put up shall pass from one building to another through any party wall or along any building wall or over any roof or under any sidewalk. No electric current shall be supplied from any trolley line for any purpose whatever to any building except for lighting the power stations from which current is supplied to such trolley lines.

598d. **Fees.** There shall be collected by the City Electrician and paid into the Treasury of the City of Chicago, upon the issuance of certificates permitting the use of electric current, the following fees:

For each arc light, the sum of one dollar.

For incandescent lamps of nominal 16 candle power, and for larger or smaller lamps in that proportion, up to and including 100 lamps, the sum of ten cents each.

For incandescent lamps, second 100, or part thereof as above, the sum of nine cents each; third 100, or part thereof as above, eight cents each; fourth 100 or part thereof as above, seven cents each; fifth 100 or part thereof as above, six cents each; for each additional 100 lamps, or part thereof as above, five cents each; but no inspection shall be made for a less amount than one dollar.

For each electrical horse-power of 746 Watts, used for mechanical or other purposes than above mentioned, the sum of one dollar for each horse-power from one to five horse-power, inclusive.

For each of the next succeeding 5 horse-powers, or part thereof as above, eighty-five cents; for each of the next succeeding 5 horse-powers, or part thereof as above, seventy-five cents; for each of the next succeeding 10 horse-powers, or part thereof as above, sixty cents; for each of the next succeeding 25 horse-powers, or part thereof as above, fifty cents; for each of the next succeeding 50 horse-powers, or part thereof as above, forty cents; for each additional horse-power, or part thereof as above, twenty-five cents; but no inspection shall be made for a less amount than one dollar.

Inspections of temporary installations for show-window exhibitions, conventions and the like, shall be charged for by the time required for such inspections at the rate of fifty cents per hour.

Each re-inspection of any overhead, underground or interior wires or apparatus, shall be charged for by the time required for such re-inspection at the rate of fifty cents per hour.

ARC LAMPS.

2 arc lamps at $1, $2; above 2 lamps to 5.....at 80 cents each
5 arc lamps, $4.40; above 5 lamps to 10.....at 70 cents each
10 arc lamps, $7.90; above 10 lamps to 20.....at 60 cents each
20 arc lamps, $13.90; above 20 lamps to 30.....at 50 cents each
30 arc lamps, $18.90; above 30 lamps.....at 25 cents each

INCANDESCENT LAMPS.

25 lamps, $2.50; above 20 to 50 lamps.....at 9 cents each
50 lamps, $4.75; above 50 to 70 lamps.....at 8 cents each
75 lamps, $6.75; above 75 to 100 lamps.....at 7 cents each
100 lamps, $8.50; above 100 to 200 lamps.....at 6 cents each
200 lamps, $14.50; above 200 to 300 lamps.....at 5 cents each
300 lamps, $19.50; above 300.....at 4 cents each

MOTORS.

5 horse power, $5; above 5 to 10 horse power.....at 75 cents
10 horse power, $8.75; above 10 to 15 horse power.....at 65 cents
15 horse power, $12; above 15 to 25 horse power.....at 55 cents
25 horse power, $17.50; above 25 to 50 horse power.....at 50 cents
50 horse power, $30; above 50.....25 cents

598e. **Record—Annual Report.** It shall be the duty of said City Electrician to keep records containing a full and accurate account of all inspections made and of all moneys received; he shall annually, on or before the first day of February in each year, prepare and present to the City Council a report showing the receipts and expenditures and entire work of his department during the previous fiscal year; and he shall at the same time send to the Comptroller a full and comprehensive statement of all matters pertaining to his department, together with an estimate in detail of the appropriations required by this department during the next fiscal year.

598f. **Alterations.** No alterations shall be made in any installation without first notifying the said City Electrician and submitting the same for similar inspection, as above provided.

598g. **Penalty.** The Furnishing or use of any electric current within the limits of the City of Chicago, by any person or persons, firm or corporation, in any manner contrary to the provisions of this Chapter, shall constitute and be a misdemeanor, and any person, firm or corporation found guilty of such misdemeanor shall be punished by a fine of not less than fifty dollars nor more than one hundred dollars, and each day's use thereof contrary to the provisions of this Chapter shall constitute and be a separate offense and misdemeanor. Said City Electrician may, for any violation of the provisions of this Chapter, also order and compel the cutting of and stopping of such current until the provisions of this Chapter are fully complied with.

The following Sections have also been passed governing electrical construction work, and made a part of Chapter LXI, Article II, of the revised Code of Chicago.

1902a. **Requirements Before Permits Can Be Issued.** All applications for permits to erect poles in the streets and alleys in the City of Chicago shall provide that the City of Chicago may use the poles to be so erected and attach thereto such necessary cross-arms, wires or other electrical appliances as may be deemed necessary for the electrical service of the city, and no permit shall be issued by the Commissioner of Public Works to any person, firm or corporation operating under a valid ordinance, in which the application and permit does not provide for the privileges required by the city as herein contained.

1902b. **Fees.** A fee of two ($2) dollars shall be charged for each permit issued by the Commissioner of Public Works for the erection of all poles, lines or wires, or electric conductors of any description whatever, or for any laying of underground electrical conduits or the placing of conductors therein.

Said fees shall be collected by the City Electrician before he countersigns any such permit, and shall be deposited by him in the City Treasury and credited to a special deposit fund to be used for the purpose of extending the electric lighting system of the city.

Table of Carrying Capacity of Wires.

Table A. Rubber Covered Wires. B. & S. G.	Amperes.	Table B. On Porcelain Knobs—Open Work.	Amperes.
18	3		
16	6		
14	12		19
12	17		24
10	24		32
8	33		43
6	46		57
5	54		63
4	65		74
3	76		83
2	90		98
1	107		117
0	127		140
00	150		157
000	177		185
0000	210		225
Circular Mills.			
200,000	200		
250,000			285
300,000	270		335
350,000			377
400,000	330		415
500,000	390		485
600,000	450		545
700,000	500		600
800,000	550		655
900,000	600		710
1,000,000	650		765
1,100,000	690		
1,200,000	730		
1,300,000	770		
1,400,000	810		
1,500,000	850		
1,600,000	890		
1,700,000	930		
1,800,000	970		
1,900,000	1,010		
2,000,000	1,050		

The lower limit is specified for rubber-covered wires to prevent gradual deterioration of high insulations by heat of wires, but not from fear of igniting the insulation. Question of drop is not taken into consideration in above tables.

The carrying capacity of sixteen and eighteen wire is given, but no smaller than fourteen is to be used, except as allowed under Rules 24 *a* and 40 *c*.

Materials.

The following is a list of non-combustible, non-absorptive, insulating materials for the benefit of those who might consider hard rubber, fiber, wood and the like as fulfilling the requirements.

1. Glass.
2. Marble (filled).
3. Slate without metal veins.
4. Porcelain, thoroughly glazed and vitrified.
5. Pure Sheet Mica.
6. Lava (certain kinds of).
7. Alberene Stone.

Electric Gas Lighting

Where electric gas lighting is to be used on the same fixture with the electric light:

No part of the gas piping or fixture shall be in electric connection with the gas lighting circuit.

The wires used with the fixtures must have a non-inflammable insulation, or, where concealed between the pipe and shell of the fixture, the insulation must be such as required for fixture wiring for the electric light.

The whole installation must be test free from "grounds."

The two installations must test perfectly free from connection with each other.

AN ACT RELATING TO FIRE ESCAPES.

Section 1. Be it enacted by the People of the State of Illinois represented in the General Assembly: That within six (6) months after the passage of this act, all buildings in this State which are four or more stories in height, excepting such as are used for private residences exclusively, but including flats and apartment buildings, shall be provided with one or more metallic ladder or stair fire escapes attached to the outer walls thereof and extending from, or suitably near the ground, to the uppermost story thereof, and provided with platforms of such forms and dimensions, and in such proximity to one or more windows of each story above the first, as to render access to such ladder or stairs from each such story easy and safe; the number, location, material and construction of such escapes to be subject to the approval of the board of supervisors in the counties under township organization, and a board of county commissioners in counties not under township organization, except in villages, towns and cities organized under any general or special law of this State, such approval shall be had by the corporate authorities of such villages, towns and cities: *Provided*, however, that all buildings more than two stories in height, used for manufacturing purposes or for hotels, dormitories, schools, seminaries, hospitals or asylums, shall have at least one such fire escape for every fifty (50) persons for which working sleeping or living accommodations are provided above the second stories of said buildings; and that all public halls, which provide seating room above the first or ground story, shall be provided with such numbers of said ladder or stair fire escapes as the board of supervisors or commissioners or corporate authorities aforesaid may direct.

Sec. 2. All buildings of the number of stories and used for the purposes set forth in Section one (1) of this act, which shall be hereafter erected within this State, shall upon or before their completion each be provided with fire escapes of the kind and number, and in the manner set forth in said Section (1) of this act.

Sec. 3. The boards of supervisors and commissioners, and in villages, towns and cities, the corporate authorities thereof, as aforesaid, shall direct the sheriff of their respective counties to serve a written notice in behalf of the people of the State of Illinois, upon the owner or owners, trustees, lessee or occupant of any buiding within their county, not provided with fire escapes in accordance with the requirements of this act commanding such owners, trustees, lessee or occupant, or either of them, to place or cause to be placed upon such building such fire escape or escapes within thirty (30) days after the service of such notice. And the grand juries of the several counties of this State may also, during any term, visit or hear testimony relating to any building or buildings within their resepective counties, for the purpose of ascertaining whether it or they are provided with fire escapes in accordance with the requirements of this act, and to submit the result of their inquiry, together with any recommendations they may desire to make, to the circuit court, except in Cook county, and to the criminal court of Cook county, and said court may thereupon, if it find from the report of said grand jury that said buildings or building is or are not provided with a fire escape or escapes in accordance with this act, cause the sheriff to serve a notice or notices upon the owner, trustees, lessee or occupant of such building or buildings.

Sec. 4. Any such owner or owners, trustees, lessee or occupant, or either of them, so served with notice as aforesaid, who shall not within thirty (30) days after the service of such notice upon him or them, place or cause to be placed such fire escape or escapes upon such building as required by this act and the terms of such notice, shall be subject to a fine of not less than twenty-five (25) nor more than two hundred (200) dollars, and, to a further fine of fifty (50) dollars for each additional week of neglect to comply with such notice.

Sec. 5. All the money or moneys collected as fines under and by virtue of this act shall be paid into or placed to the credit of the common school fund of the counties in which they are collected.

Sec. 6. Any person may at any time make complaint in writing to the board of supervisors or commissioners or corporate authorities whose duty it is hereunder to enforce this law, that such escape or escapes are needed or are unsafe or insufficient, and it shall be the duty of such board of supervisors or commissioners or corporate authorities to at once inspect such building and escape or escapes and cause the sheriff to notify the owner, occupant or party in control, to immediately take such steps as to overcome the cause of complaint, and any officer, officers or persons failing to comply with this act, upon such complaint being made, shall be fined upon conviction, for each offense, not less than five dollars nor more than one hundred dollars, in any court of competent jurisdiction.

Sec. 7. That an act entitled, "An act relating to fire escapes for buildings," approved May 27, 1897, and in force July 1, 1897, and all other acts and parts of acts inconsistent with the provisions of this act, be and the same are hereby repealed.

Sec. 8. Whereas, an emergency exists that this act shall take effect without delay, therefore this act shall take effect and be in force from and after its passage.

CITY OFFICIALS.

ROBT. E. BURKE	Oil Inspector.
JAMES A. QUINN	City Sealer.
L. E. McGANN	City Comptroller.
F. W. BLOCKI	Commissioner of Public Works.
CHAS. F. GUNTHER	City Treasurer.
WILLIAM LOEFFLER	City Clerk.
EDW. B. ELLICOTT	City Electrician.
JOHN O'NEILL	Track Elevation.
F. X. BRANDECKER	City Collector.
DR. A. R. REYNOLDS	Health Department
IRVING WASHINGTON	Department of Supplies.
JOHN A. MAY	Special Assessment.
M. J. DOHERTY	Bureau of Streets.
WM. QUINN (in charge)	Bureau of Sewers.
JOHN E. ERICSON	Bureau of Engineering.
DR. JOHN W. ELA	
JOHN POWELL	Civil Service.
ROBERT LINDBLOM, President	
PETER KIOLBASSA	Building Department.
FRANCIS O'NEILL	Chief of Police.
WM. H. MUSHAM	Fire Department.
CHAS. M. WALKER	Corporation Counsel.
JAMES WALLACE	Water Pipe Extension Department.
ANDREW J. RYAN	City Attorney.
DR. HOWARD S. TAYLOR	City Prosecutor.
C. J. BUHMAN	Map Department.
HUGO GROSSER	City Librarian.
EDW. WILLMAN	Bridge Department.
DR. J. F. TODD	City Physician.
H. O. NOURSE	Bureau of Water.
LUKE COLLERAN	Chief of Detectives.

LICENSED ARCHITECTS.

The following, who attended the last examination, have received licenses:

WALTER B. GRIFFIN	Elmhurst, Ill.
OTTO ZIPPWALD	1304 Diversey Boulevard, Chicago.
RICHARD B. KETCHUM	Monadnock Block, Chicago.
HERMANN M. HADLEY	Topeka, Kan.

The following licenses heretofore revoked have been restored recently:

RICHARD H. SALTER	402 Woolner Building, Peoria.
ALFRED H. BICKNELL	1538 Monroe Street, Chicago.
OSBORNE J. PIERCE	2163 Monroe Street, Chicago.
FREDERICK BAUMANN	78 La Salle Street, Chicago.
WM. F. BURFEIND	220 Fifth Street, Racine, Wis.
ASA LYON	St. Nicholas Hotel, Springfield.
SYLVANUS G. WHITFORD	914 Fourth Avenue, Peoria.
JOHN T. LONG	185 Dearborn Street, Chicago.
HARRY P. MOZIER	157 Michigan Avenue, Chicago.
JOHN DUNCAN	603, 91 Dearborn Street, Chicago.

GRAVEL ROOFING.

Appended are three specifications for good work:

Five (5) Ply Wood Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put four (4) thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than nine (9) inches between each layer, with best roofing cement, using not less than one hundred (100) pounds of roofing cement to the square of one hundred (100) feet. All joinings along walls and around openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through ⅝-inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

Six (6) Ply Cap Sheet Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put four (4) thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than nine (9) inches between each layer, with best roofing cement, using not less than one hundred and twenty (120) pounds of roofing cement to the square of one hundred (100) feet. The entire surface then to be mopped over with roofing cement and a cap sheet of wool felt applied. All joinings along the walls and around the openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through ⅝-inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

Six (6) Combined Flax and Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put one (1) layer of flax felt and three thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than eleven (11) inches between each layer, with best roofing cement, using not less than one hundred and twenty (120) pounds of roofing cement to the square of one hundred (100) feet. The entire surface then to be mopped over with roofing cement and a cap sheet of wool felt applied. All joinings along walls and around openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through ⅝-inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

MISCELLANEOUS AND USEFUL INFORMATION.

Useful Notes.

Roof boards weigh about three pounds per superficial foot.

Terra cotta tiling weighs from 25 to 35 pounds per square foot.

Hollow tile for five-inch partition weighs from 22 to 35 pounds per superficial foot.

Lath and plastering, two-coat work, weighs from 9 to 12 pounds per superficial foot.

The weight of a superficial foot of brickwork eight inches thick, including mortar, is from 83 to 87 pounds.

An iron roof 100 feet wide, with a rise of one-third pitch, will weigh from 10 to 15 pounds per superficial foot.

One hundred pounds per square foot distributed uniformly over a surface of a bridge is a safe working standard.

The weight per square foot of roof tiling, set in iron or between wood rafters ready for slating, is about 12 pounds.

A fireproof floor constructed of iron beams and four-inch brick arches will weigh from 65 to 75 pounds per superficial foot.

The safe and proper bearing of joist, timber and girders supporting a floor should not exceed ten tons on brick walls and fourteen tons on good stone walls.

A fireproof floor constructed of iron beams and of iron arches made of No. 18 iron, and filled in on top with concrete or slag and cement, will weigh about the same as brickwork four inches thick.

Smallest convenient size of slab for a 14-inch washbowl, 21 by 24 inches. Height of slab from floor, 2 feet 6 inches. Very small (12) inch corner washbowl: slab 1 foot 11 inches each side.

Space occupied by water closets, 2 feet 6 inches wide, 2 feet deep.

Urinals should be not less than 2 feet 2 inches between partitions; partitions 6 feet high.

Horse Stalls.—Width, 3 feet 10 inches to 4 feet, or over 5 feet in width and 9 feet long. Width should not be between 4 and 5 feet, as in such cases the horse is liable to cast himself.

Pitch of Tin, Copper or Tar and Gravel Roof.—Five-eighths of an inch to the foot and upward.

A load of mortar measures a cubic yard, requires a cubic yard of sand and nine bushels of lime, and will fill thirty hods.

A bricklayer's hod measuring one foot four inches by nine inches, equals 1,296 cubic inches in capacity, and contains twenty bricks.

A single load of sand or other materials equals a cubic yard.

One thousand bricks closely stacked occupy about fifty-six cubic feet.

One thousand old bricks cleaned and loosely stacked occupy about seventy-two cubic feet.

One hundred yards of plastering will require fourteen hundred laths, four and a half bushels of lime, four-fifths of a load of sand, nine pounds of hair and five pounds of nails, for two-coat work.

A bushel of hair weighs, when dry, about fifteen pounds.

Flashings.—By "flashings" are meant pieces of tin, zinc or copper laid over slate, and up against wall, chimneys, copings, etc.

Counter flashings are of lead or zinc, and are solid between the courses in brick, and turned down over the flashings.

In flashing against stonework, grooves should be cut to receive the counter flashing.

Water.

1 cubic foot of water equals 62.5 pounds, or 7.48 U. S. gallons.
1 cubic inch of water equals .036 pounds.
1 cubic foot of water equals 6.2355 Imp. gallons or 7.48 U. S. gallons.
1 cylindrical foot of water equals 49.1 pounds or 5.89 U. S. gallons.
1 U. S. gallon of water equals 8.34 pounds.
1 U. S. gallon of water equals 231 cubic inches.

1 pound pressure per square inch is equivalent to a head of water of 2.3093 feet; 1 pound—27.71 inches; 14.7 pounds or 1 atmosphere—33.947 feet, or 10.347 metres; 0.433 pound or 1 atmosphere—1 foot: 43.3 pounds—100 feet.

Capacity of Cisterns.

For a circular cistern, square the diameter and multiply by .7854, for the area; multiply this by 1,728 and divide by 231, for number of gallons of one foot in depth; for a square cistern, multiply length by breadth, and proceed as above.

CIRCULAR CISTERN.	SQUARE CISTERN.
5 feet in diameter holds 4.66 bbls.	5 feet by 5 feet holds 5.92 bbls.
6 feet in diameter holds 6.71 bbls.	6 feet by 6 feet holds 8.54 bbls.
7 feet in diameter holds 9.13 bbls.	7 feet by 7 feet holds 11.63 bbls.
8 feet in diameter holds 11.93 bbls.	8 feet by 8 feet holds 15.19 bbls.
9 feet in diameter holds 15.10 bbls.	9 feet by 9 feet holds 19.39 bbls.
10 feet in diameter holds 18.65 bbls.	10 feet by 10 feet holds 23.74 bbls.

Tests for Pure Water.

Color: Fill a clean long bottle of colorless glass with the water; look through it at some black object. It should look colorless and free from suspended matter. A muddy or turbid appearance indicates soluble organic matter or solid matter in suspension. Odor: Fill the bottle half full, cork it, and leave it in a warm place for a few hours. If when uncorked it has a smell the least repulsive, it should be rejected for domestic use. Taste: If water at any time, even after heating, has a disagreeable taste, it should be rejected.

A simple semi-chemical test is known as the "Heisch test." Fill a clean pint bottle three-fourths full of the water; add a half-teaspoonful of clean granulated or crushed loaf sugar; stop the bottle with glass or a clean cork and let it stand in a light and moderately warm room for forty-eight hours. If the water becomes cloudy, or milky, it is unfit for domestic use.

Expansion of Water (Dalton).

Temperature.	Expansion.	Temperature.	Expansion.	Temperature.	Expansion.
22°	1.0009	72°	1.0018	152°	1.01934
32	1	92	1.00477	172	1.02575
*46	1	112	1.0088	192	1.03265
52	1.00021	132	1.01367	212	1.0466

*Greatest density at 39.1° Fahr.

Table showing the velocity of discharge of different sized sewers.

Diam. of pipe.	180 feet per minute, 3 feet per second.		270 feet per minute, 4½ feet per second.		360 feet per minute, 6 feet per second.		540 feet per minute, 9 feet per second.	
Inches.	Fall.	Gallons per minute.	Fall.	Gallons per minute.	Fall.	Gallons per minute.	Fall.	Gallons per minute.
3.....	1 in 69	54	1 in 30.4	81	1 in 17.2	108	1 in 7.6	162
4.....	1 in 92	96	1 in 40.8	144	1 in 23.	192	1 in 10.2	288
6.....	1 in 138	216	1 in 61.2	324	1 in 34.5	432	1 in 15.3	648
9.....	1 in 207	495	1 in 92.	742.5	1 in 51.7	990	1 in 23	1,485

Rules for Calculating Speed of Pulleys.

I.—The diameter of the driver and driven being given, to find the number of revolutions of the driven:

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions.

II.—The diameter and the revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time:

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of revolutions of the driven; the quotient will be its diameter.

III.—To ascertain the size of the driver:

Rule.—Multiply the diameter of the driven by the number of revolutions you wish to make, and divide the product by the revolutions of the driver: the quotient will be the size of the driver.

Belts.

Leather belts must be well protected against water, and even moisture.

India-rubber is the proper substance for belts exposed to the weather.

It is desirable to run the grain (hair) side of leather belts on the pulley, in order that the strongest part of the belt may be subject to the least wear.

Leather belts run with grain side to the pulley will drive thirty per cent more than if run with flesh side. The belt, as well as the pulley, adheres best when smooth, and the grain side adheres best because it is smoothest.

The transmitting power of a double belt is to that of single belt as 10 is to 7. In ordering pulleys, the kind of belt to be used should always be specified.

Belts should be kept soft and pliable. For this purpose blood-warm tallow, dried in by heat of fire or the sun, is advised. Castor-oil dressing is also good.

The motion of driving should run *with* and not *against* the laps of the belts.

If too great a distance is attempted, the weight of the belt will produce a very heavy sag, drawing so hard on the shaft as to produce great friction in the bearings, while at the same time the belt will have an unsteady, flapping motion, which will destroy both the belt and machinery.

If possible to avoid it, connected shafts should never be placed one directly over the other, as in such case the belt must be kept very tight to do the work. For this purpose belts should be carefully selected of *well-stretched* leather.

It is desirable that the angle of the belt with the floor should not exceed 45 degrees. It is also desirable to locate the shafting and machinery so that belts should run off from each shaft in opposite directions, as this arrangement will relieve the bearings from the friction that would result when the belts all pull one way on the shaft.

The diameter of the pulleys should be as large as can be admitted.

The pulley should be a little wider than the belt required for the work.

When it is not convenient to measure with the tape line the length required, apply the following rule: Add the diameter of the two pulleys together, divide the result by 2, and multiply the quotient by 3¼, then add this product to twice the distance between the centers of the shafts, and you have the length required.

The width of belt needed depends on three conditions: 1. The tension of the belt. 2. The size of the smaller pulley, and the proportion of the surface touched by the belt. 3. The speed of the belt.

The working adhesion of a belt to the pulley will be in proportion both to the number of square inches of belt contact with the surface of the pulley and also to the arc of the circumference of the pulley touched by the belt. This adhesion forms the basis of all right calculation in ascertaining the width of belt necessary to transmit a given horse-power.

The average width of a shingle is four inches. Hence, when shingles are laid four inches to the weather each shingle averages 16 square inches, and 900 are required for a square of roofing (100 square feet). If 4½ inches to the weather, 800; 5 inches, 720; 5½ inches, 655; 6 inches, 600.

Weight per Square Foot of Sheet Lead.

$\frac{1}{32}$ inch thick	2 lbs.	$\frac{1}{16}$ inch thick	7 lbs.
$\frac{3}{64}$ " "	2½ "	$\frac{1}{8}$ " "	8 "
$\frac{1}{25}$ " "	3 "	$\frac{5}{32}$ " "	10 "
$\frac{1}{16}$ " "	4 "	$\frac{3}{16}$ " "	12 "
$\frac{1}{14}$ " "	5 "	$\frac{7}{32}$ " "	14 "
$\frac{1}{12}$ " "	6 "	$\frac{1}{4}$ " "	16 "

Gauges and Their Equivalents.

No. 27, equal to	$\frac{1}{64}$ inch.	No. 12, equal to	$\frac{7}{64}$ inch.
" 21, " "	$\frac{1}{32}$ "	" 10, " "	$\frac{1}{8}$ "
" 18, " "	$\frac{3}{64}$ "	" 8, " "	$\frac{11}{64}$ "
" 16, " "	$\frac{1}{16}$ "	" 6, " "	$\frac{3}{16}$ "
" 14, " "	$\frac{5}{64}$ "	" 5, " "	$\frac{7}{32}$ "
" 13, " "	$\frac{3}{32}$ "	" 4, " "	$\frac{1}{4}$ "

Capacity of Drain Pipe.

Size of Pipe.	Gallons per Minute.							
	½-in. Fall per 100 ft.	3-in. Fall per 100 ft.	6-in. Fall per 100 ft	9-in. Fall per 100 ft.	12-in. Fall per 100 ft.	18-in. Fall per 100 ft.	24-in Fall per 100 ft.	36-in. Fall per 100 ft.
3-inch	21	30	42	52	60	74	85	104
4 "	36	52	76	92	108	132	148	184
6 "	84	120	169	206	240	294	338	414
9 "	232	330	470	570	660	810	930	1140
12 "	470	680	960	1160	1360	1670	1920	2350
15 "	830	1180	1680	2040	2370	2920	3340	4100
18 "	1300	1850	2630	3200	3740	4600	5270	6470
20 "	1760	2450	3450	4180	4860	5980	6850	8410

Grade per Mile.

The following table will show the grade per mile:

An inclination of

1 foot in 15 is 352 feet per mile.
1 foot in 20 is 264 feet per mile.
1 foot in 25 is 211 feet per mile.
1 foot in 30 is 176 feet per mile.
1 foot in 35 is 151 feet per mile.
1 foot in 40 is 132 feet per mile.
1 foot in 50 is 106 feet per mile.
1 foot in 100 is 53 feet per mile.
1 foot in 125 is 42 feet per mile.

To find quantity of water elevated in one minute running at 100 feet of piston speed per minute: Square the diameter of the water cylinder in inches and multiply by 4. Example: Capacity of a 5-inch cylinder is desired. The square of the diameter (5 inches) is 25, which, multiplied by 4, gives 100, the number of gallons per minute (approximately).

To find the depth of a joist, the length of bearing and the thickness being given:

Rule.—Divide the square of the length in feet by the thickness in inches, and the cube root of the quotient, multiplied by 2.2 for pine, or 2.3 for oak, will be the depth in inches.

Slating.

Slating is estimated by the "square," which is the quantity required to cover 100 square feet. The slates are usually laid so that the third laps the first three inches.

Number of Slates per Square.

Size in Inches.	Pieces per Square.	Size in Inches.	Pieces per Square.	Size in Inches.	Pieces per Square.
6 × 12	533	8 × 16	277	12 × 20	141
7 × 12	457	9 × 16	246	14 × 20	121
8 × 12	400	10 × 16	221	11 × 20	137
9 × 12	355	9 × 18	213	12 × 22	126
7 × 14	374	10 × 18	192	14 × 22	108
8 × 14	327	12 × 18	160	12 × 24	114
9 × 14	291	10 × 20	169	14 × 24	98
10 × 14	261	11 × 20	154	16 × 24	86

The weight of slate per cubic foot is about 174 pounds, or per square foot of various thicknesses as follows:

Thickness in inches.....	1/8	3/16	1/4	3/8	1/2
Weight in pounds.....	1.81	2.71	3.62	5.43	7.25

Handy Table.

Diameter of a circle × 3.1416 = circumference.
Radius of a circle × 6.283185 = circumference.
Square of the diameter of a circle × 0.7854 = area.
Square of the circumference of a circle × 0.07958 = area.
Half the circumference of a circle × half its diameter = area.
Circumference of a circle × 0.159155 = radius.
Square root of the area of a circle × 0.56419 = radius.
Circumference of a circle × 0.31831 = diameter.
Square root of the area of a circle × 1.12838 = diameter.
Diameter of a circle × 0.86 = side of inscribed equilateral triangle.
Diameter of a circle × 0.7071 = side of an inscribed square.
Circumference of a circle × 0.225 = side of an inscribed square.
Circumference of a circle × 0.282 = side of an equal square.
Diameter of a circle × 0.8862 = side of an equal square.
Diameter of a circle × 0.8862 = side of an equal square.
Base of a triangle × ½ the altitude = area.
Multiplying both diameters and .7854 together = area of an ellipse.
Surface of a sphere × 1/6 of its diameter = solidity.
Circumference of a sphere × its diameter = surface.
Square of the diameter of a sphere × 3.1416 = surface.
Square of the circumference of a sphere × 0.3183 = surface.
Cube of the diameter of a sphere × 0.5236 = solidity.
Cube of the radius of a sphere × 4.1888 = solidity.
Cube of the circumference of a sphere × 0.016887 = solidity.
Square root of the surface of a sphere × 0.56419 = diameter.
Square root of the surface of a sphere × 1.772454 = circumference.
Cube root of the solidity of a sphere × 1.2407 = diameter.
Cube root of the solidity of a sphere × 3.8978 = circumference.
Radius of a sphere × 1.1547 = side of inscribed cube.
Square root of (⅓ of the square of) the diameter of a sphere = side of inscribed cube.
Area of its base × ⅓ of its altitude = solidity of a cone or pyramid, whether round, square, or triangular.
Area of one of its sides × 6 = surface of a cube.
Altitude of trapezoid × ½ the sum of its parallel sides = area.

Table for Mixing Paints.

In forming the following named colors, mix as they come in order, the predominant being first; second, next; third, next, and so on:

Gray—use white lead and lampblack.
Buff—use white lead, yellow ochre and red.
Pearl—use white, black and blue.
Orange—use yellow and red.
Purple—use violet, red and white.
Gold—use white, stone ochre and red.
Olive—use yellow, blue, black and white.
Chestnut—use red, black and yellow.
Flesh—use white, yellow ochre and vermillion.
Limestone—use white, yellow ochre, black and red.
Fawn—use white, yellow and red.
Chocolate—use raw umber, red and black.
Drab—use white, raw and burnt umber; or, white, yellow ochre, red and black.
Bronze-Green—use chrome green, black and yellow; or, black and yellow; or, yellow, black and green.
Pea-Green—use white and chrome green.
Rose—Use white, maddder and lake.
Copper—use red, yellow and black.
Lemon—use white and yellow.
Snuff—use yellow and vandyke brown.

Shingle Stains.

Should contain a large amount of creosote for their base, and the highest grades of English ground colors, and the proper amount of fixative oil to make the colors durable and lasting. Stains are artistic colorings, and give an effect that can be got in no other way. Stains can be applied with a brush, as paint is, after the shingles are laid, or the shingles can be dipped in the stain. The coloring effect is about the same in either case, but the dipping preserves the shingles best.

Covering capacity, based on the regulation sawed cedar shingle, 4 by 16, is as follows: One brush coat, 1 gallon to 150 square feet of surface; two brush coats, 1 gallon to 100 square feet of surface; dipping, $2\frac{1}{2}$ gallons to $2\frac{3}{4}$ gallons to 1,000 shingles; dipping, and applying one brush coat after the shingles are laid, 3 gallons to 1,000 shingles. But two-thirds the length of the shingle need be dipped. When the roof-water is to be used for drinking, it should be turned off from the cistern until two or three hard rains have washed off the superfluous stain.

Dimensions of a Barrel.—Diameter of head, 17 inches; bung, 19 inches; length, 28 inches; volume, 7,680 cubic inches.

One coat or priming will take, for 100 yards of painting, twenty pounds of lead and four gallons of oil. Two-coat work, forty pounds of lead and four gallons of oil; three-coat, the same quantity as two coats; so that a fair estimate for 100 yards of three-coat would be 100 pounds of lead and sixteen gallons of oil.

A box 24 inches long by 16 inches wide and 28 inches deep will contain a barrel, or three bushels; 24 by 16 inches and 14 inches deep contains half a barrel; 16 inches square and $8\frac{2}{5}$ inches deep will contain one bushel; 16 by $8\frac{2}{5}$ inches and 8 inches deep will contain half a bushel; 8 by $8\frac{2}{5}$ inches and 8 inches deep will contain one peck; 8 inches square and $4\frac{1}{5}$ inches deep will contain one gallon; 7 by 4 inches and $4\frac{4}{5}$ inches deep will contain half a gallon; 4 inches square and $4\frac{1}{5}$ inches deep will contain one quart; 4 feet long, 3 feet 5 inches wide and 2 feet 8 inches deep will contain one ton of coal, or 36 cubic feet.

Hot-Water and Steam Heating—Overhead System.

In using steam for the heating of high buildings, it is necessary to use the overhead plan, unless some automatic system of expelling the air is adopted. It requires less power to force the air through the standpipe than it would through a large number of risers. The air is forced out on the descent of the steam, and less fuel and power are necessary.

The overhead hot-water system is coming into general use, as it can be put in so that the farthest radiators in a building will heat at the same time as those nearer the boiler, and the result will also be felt in rooms in the basement—the principle of the siphon causing the effect.

The pipes from the main in the attic, from which the several branches are taken, can be pitched so that heat in the several parts of a building will result as quickly as desired; either an open or closed tank can be used. The pipes exposed in attic should be covered. Opinions vary as to the sizes of pipe to be used.

RADIATION REQUIRED UNDER ORDINARY EXPOSURE.

	Width.	Length.	Height.	Ratio.	Square feet of radiation.
Parlor	15.6	16.6	10.0	50	51
Dining room	12	16.6	10.0	60	34
Hall	12	12	10.0	25	57
Chamber, front	13.6	15.6	9.6	55	36
Chamber, rear	12.6	16.6	9.6	60	32
Chamber	12.6	17	9.6	60	53
Bathroom	7	8	9.6	55	9
Chamber, attic	12.3	17	9	76	24
Chamber, rear	12.6	13.3	9	80	18

List of Sizes of Steam Mains.

To determine the size of pipes no fixed rule can be given which will apply in all cases. A rule that has generally been accepted by steam fitters as good practice, is to allow the area of a one-inch pipe (.7854 square inches) for every 100 square feet of radiating surface, including mains.

Radiation.	One-pipe work.	Two-pipe work.
40 to 50 square feet	1 inch	$\frac{3}{4}$ x $\frac{3}{4}$ inch
100 to 125 square feet	$1\frac{1}{4}$ inch	1 x $\frac{3}{4}$ inch
125 to 250 square feet	$1\frac{1}{2}$ inch	$1\frac{1}{4}$ x 1 inch
250 to 400 square feet	2 inch	$1\frac{1}{2}$ x $1\frac{1}{4}$ inch
400 to 650 square feet	$2\frac{1}{2}$ inch	2 x $1\frac{1}{2}$ inch
650 to 900 square feet	3 inch	$2\frac{1}{2}$ x 2 inch
900 to 1,250 square feet	$3\frac{1}{2}$ inch	3 x $2\frac{1}{2}$ inch
1,250 to 1,600 square feet	4 inch	$3\frac{1}{2}$ x 3 inch
1,600 to 2,050 square feet	$4\frac{1}{2}$ inch	4 x $3\frac{1}{2}$ inch
2,050 to 2,500 square feet	5 inch	$4\frac{1}{2}$ x 4 inch
2,500 to 3,600 square feet	6 inch	5 x $4\frac{1}{2}$ inch
3,600 to 5,000 square feet	7 inch	6 x 5 inch
5,000 to 6,500 square feet	8 inch	7 x 6 inch
6,500 to 8,100 square feet	9 inch	8 x 6 inch
8,100 to 10,000 square feet	10 inch	9 x 6 inch

Tin Roofs.

Tin roofs should be laid with cleats.

There are two kinds of tin—"bright tin," the coating of which is all tin, that is, the tin proper; and "tern," "leaded," or "roofing" tin, the coating of which is a composition, part tin and part lead. This last will not rust any quicker, but the sulphur in soft coal smoke eats through the "leaded" coating sooner than through the "tinned."

Sizes of tin, 10 by 14 and 14 by 20, and two grades of thickness—IC light, and IX, heavy. For a steep roof (one-sixth pitch or over) the IC 14 by 20 tin ("leaded" if high up where little smoke will get to it; "bright" if low down), put on with a standing groove, and with the cross seams put together with a double lock, makes as good a roof as can be made. For flat roofs IX 10 x 14 "light" is best, laid with cleats, but the others make good roofs and any of them will last twenty-five years at least, if painted periodically.

Number of Square Feet a Box of Roofing Tin Will Cover.—For flat seam roofing, using $\frac{1}{2}$-inch locks, a box of "14 by 20" size will cover about 192 square feet, and for standing seam, using $\frac{3}{8}$-inch locks and turning $1\frac{1}{4}$ and $1\frac{1}{2}$ inch edges, making 1-inch standing seams, it will lay about 168 square feet.

For flat seam roofing, using $\frac{1}{2}$-inch locks, a box of "28 by 20" size will cover about 399 square feet, and for standing seam, using $\frac{3}{8}$-inch locks and turning $1\frac{1}{4}$ and $1\frac{1}{2}$ inch edges, making 1-inch standing seams, it will lay about 365 square feet.

Every box of roofing plates (IC or IX "14 by 20" or "28 by 20" sizes) contains 112 sheets.

Strains.

Tension, as in the case of a weight suspended from one end of a rod, rope, tie-bar, etc., the other end being fixed, tending to stretch or lengthen the fibers.

Shearing strain, as in the case of tree nails, pins in bridges, etc., where equal forces are applied on opposite sides in such a manner as to tend to force one part over the adjacent one.

Compression, as in the case of a weight resting on top of a column or post, tending to compress the fibers.

Transverse or cross strain, as in the case of a load on a beam tending to bend it.

Torsion, a twisting strain, which seldom occurs in building construction, though quite frequently in machinery.

Important Points in Figuring Dimensions of a Stable.

The proper height and width of a stable door is not less than nine feet square. Width and height of vehicles is as follows:

	Height.		Length.	Width.	
	Ft.	In.	Ft.	Ft.	In.
Brougham	7	0	11	6	0
Rockaway	7	0	11	6	0
Victoria	7	6	12	6	0
Demi-coach	7	0	12	6	0
Phaeton	8	6	10	6	0
Berlin Coach	7	6	13	6	6
Landau	7	6	13	6	6
Double suspension victoria	8	0	13	7	0
Vis-a-vis	7	0	12	6	0
Body brake	9	0	11	7	0
Goddard phaeton	8	0	9	6	0
Stanhope	8	0	9	6	0
Buggy	9	0	9	6	0
Single trap	6	0	9	6	0
Mail coach	9	0	15	7	6
Omnibus	8	0	11	7	0

Metric Tables.

	Approximate Equivalent.		Accurate Equivalent.
1 inch ..... [length]..	2½	cubic centimeters	2.539
1 centimeter	0.4	inch	0.393
1 yard	1	meter	0.914
1 meter (39.37 inches).....	1	yard	1.093
1 foot	30	centimeters	30.479
1 kilometer (1,000 meters).....	⅝	mile	0.621
1 mile	1½	kilometers	1.600
1 gramme .....[weight]..	15½	grains	15.432
1 grain.....	0.064	gramme	0.064
1 kilogramme (1,000 grammes).....	2.2	pounds avoirdupois.....	2.204
1 pound avoirdupois	½	kilogramme	0.453
1 ounce avoirdupois (437½ grains).....	28⅓	grammes	28.349
1 ounce troy, or apothecary (480 grains)..	31	grammes	31.103
1 cubic centimeter .....[bulk]..	1.06	cubic inch	0.060
1 cubic inch.....	16⅓	cubic centimeters	16.386
1 liter (1,000 cubic centimeters).....	1	U. S. standard quart.....	0.946
1 United States quart.....	1	liter	1.057
1 fluid ounce.....	29½	cubic centimeters	29.570
1 hectare (10,000 square meters) [surface]	2½	acres	2.471
1 acre	0.4	hectare	0.40

In the nickel five-cent piece of our coinage is a key to the tables of linear measures and weights. The diameter of this coin is two centimeters, and its weight is five grammes. Five of them placed in a row will give the length of the decimeter, and two of them will weigh a decagram. As the kiloliter is a cubic meter, the key to the measure of length is also the key to the measure of capacity.

Size of the Billiard Room, Gas Light, Etc.

The space required for the different sized tables is as follows:

For table 6 x 12.....Room should be 16 x 22
For table 5½ x 11.....Room should be 15½ x 21
For table 5 x 10.....Room should be 15 x 20
For table 4½ x 9.....Room should be 14 x 18½
For table 4 x 8.....Room should be 13 x 17
For table 3½ x 7.....Room should be 12½ x 16

The following directions for arranging the lights over billiard tables will be found useful. The distance of the light from the floor should be about 6 feet 2 inches. For a 5½ by 11 table, cross-arms 31 inches and long arms 62 inches. For a 5 by 10 table, the cross-arms of the pendant should measure, from light to light, 28 inches and the long arm 56 inches. For a 4½ by 9 table, cross-arms 25 inches and long arms 50 inches. For a 4 by 8 table, cross-arms 22 inches and long arms 44 inches.

BOWLING ALLEY STANDARD SIZE

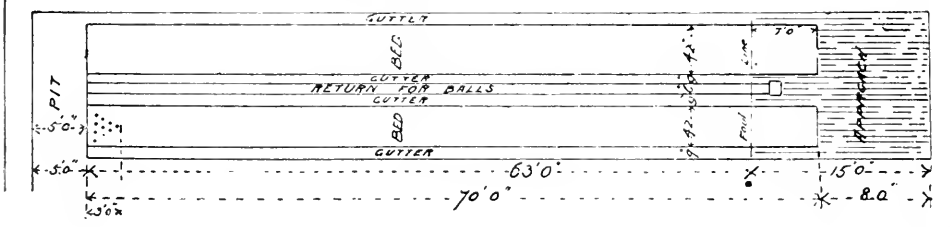
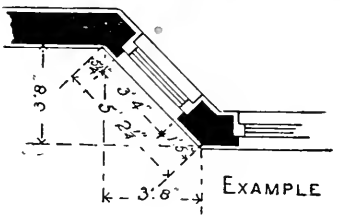


Table Showing the Length of Sides of Bays, Angle being 45 Degrees.



1 ft.	6 in.	by	1 ft.	6 in.	.....	2 ft.	$1\frac{7}{16}$ in.		2 ft.	10 in.	by	2 ft.	10 in.	.....	4 ft.	$0\frac{1}{16}$ in.							
1 "	7 "	"	1 "	7 "	.....	2 "	$2\frac{7}{8}$ "		2 "	11 "	"	2 "	11 "	.....	4 "	$1\frac{1}{2}$ "							
1 "	8 "	"	1 "	8 "	.....	2 "	$4\frac{1}{4}$ "		3 "	0 "	"	3 "	0 "	.....	4 "	$2\frac{15}{16}$ "							
1 "	9 "	"	1 "	9 "	.....	2 "	$5\frac{11}{16}$ "		3 "	1 "	"	2 "	1 "	.....	4 "	$4\frac{5}{16}$ "							
1 "	10 "	"	1 "	10 "	.....	2 "	$7\frac{1}{8}$ "		3 "	2 "	"	3 "	2 "	.....	4 "	$5\frac{3}{4}$ "							
1 "	11 "	"	1 "	11 "	.....	2 "	$8\frac{1}{2}$ "		3 "	3 "	"	3 "	3 "	.....	4 "	$7\frac{1}{8}$ "							
2 "	0 "	"	2 "	0 "	.....	2 "	$9\frac{15}{16}$ "		3 "	4 "	"	3 "	4 "	.....	4 "	$8\frac{9}{16}$ "							
2 "	1 "	"	2 "	1 "	.....	2 "	$11\frac{3}{8}$ "		3 "	5 "	"	3 "	5 "	.....	4 "	10 "							
2 "	2 "	"	2 "	2 "	.....	3 "	$0\frac{3}{4}$ "		3 "	6 "	"	3 "	6 "	.....	4 "	$11\frac{3}{8}$ "							
2 "	3 "	"	2 "	3 "	.....	3 "	$2\frac{3}{16}$ "		3 "	7 "	"	3 "	7 "	.....	5 "	$1\frac{5}{16}$ "							
2 "	4 "	"	2 "	4 "	.....	3 "	$3\frac{5}{8}$ "		3 "	8 "	"	3 "	8 "	.....	5 "	$2\frac{1}{4}$ "							
2 "	5 "	"	2 "	5 "	.....	3 "	5 "		3 "	9 "	"	3 "	9 "	.....	5 "	$3\frac{5}{8}$ "							
2 "	6 "	"	2 "	6 "	.....	3 "	$6\frac{7}{16}$ "		3 "	10 "	"	3 "	10 "	.....	5 "	$5\frac{1}{16}$ "							
2 "	7 "	"	2 "	7 "	.....	3 "	$7\frac{7}{8}$ "		3 "	11 "	"	3 "	11 "	.....	5 "	$6\frac{1}{2}$ "							
2 "	8 "	"	2 "	8 "	.....	3 "	$9\frac{1}{4}$ "		4 "	0 "	"	4 "	0 "	.....	5 "	$7\frac{7}{8}$ "							
2 "	9 "	"	2 "	9 "	.....	3 "	$10\frac{11}{16}$ "																

Results of tests by Prof. Thomas Wilson to ascertain the amount of light passing through or obstructed by glass.

	Percentage of Light.	
	Admitted.	Obstructed.
American Crystal, ground one side	50.00	50.00
Clear Plate	87.50	12.50
American Crystal, clear, double thick	87.50	12.50
American Crystal, clear, single thick	87.50	12.50
Plate, ground one side	50.00	50.00
Plate, ground two sides	37.50	62.50
American Crystal, ground two sides	37.50	62.50
Hammered ¼ inch thick	87.50	12.50
Ribbed ¼ inch thick	75.00	25.00

Sizes of Piano.

7⅓ Octaves.

	Height.	Length.	Width.
Upright	about 4 ft. 3 in.	5 ft. 4 in.	2 ft. 3 in.
Small or Baby Grand	about 3 ft. 2 in.	6 ft. 0 in.	4 ft. 10 in.
Parlor Grand	about 3 ft. 2 in.	7 ft. 6 in.	5 ft. 0 in.

Transmission of Heat by Various Substances.

Window glass being	1,000
Oak or Walnut	66
White Pine	80
Pitch "	100
Lath and Plaster	75 to 100
Brick (rough)	200 to 250
" Whitewashed	200
Granite or Slate	250
Sheet Iron	1030 to 1110

Table Showing Amount of Glass Surface which may be Heated by 1 Square Foot of Radiating Surface in Good Buildings.

	Hot Water.			Steam.	
Temperature of radiating surface (radiators) Fahr	160°	180°	200°	227° 5 Lbs.	240° 10 Lbs.
	Square Feet of Glass to 1 Square Foot Radiator Surface.				
Temperature above surrounding air 90°	1.9	2.3	2.8	3.3	3.8
" " " " 80°	2.3	2.9	3.5	4.0	4.6
" " " " 70°	3.0	3.6	4.2	5.0	5.7
" " " " 60°	4.0	4.6	5.25	6.0	7.0
" " " " 50°	5.0	6.0	6.8	8.0	9.0
" " " " 40°	6.9	8.0	8.2	10.0	11.5

Proportion of Parts of Steam Heating Boilers.

From Prof. R. C. Carpenter.

Radiating surface=square feet	250	500	750	1000	1500	2000	3000	4000	5000	7500	10000
Nominal horse-power	2.5	5.0	7.5	10.0	15.0	20.0	30.0	40.0	50.0	75.0	100.0
Ratio radiating to heating surface	4.5	5.1	5.4	5.6	6 0	6.2	6.7	6.9	7.0 / 9.0*	7.0 / 9.0*	7.0 / 9.0*
Probable evaporation per lb. coal	5.5	5.7	6.0	6.5	7.0	7.5	8.0	8 5	9.0	9.5	10.0
Pounds of steam per sq. ft. grate (A)	55.0	57.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0	100.0
Pounds of steam per sq. ft. grate (B)	44 0	46.0	48.0	52.0	56.0	60.0	64 0	68.0	72.0	76.0	80.0
Ratio radiating to grate surface (A)	165.0	171.0	180.0	195.0	210.0	225 0	240.0	255.0	270.0	285.0	300.0
Ratio radiating to grate surface (B)	132.0	138.0	144.0	156.0	168.0	180.0	192.0	204 0	216.0	228.0	240.0
Ratio heating to grate surface (A)	36.5	33.2	33 2	34.8	35.0	36 2	36.5	37.0	38.5	40.5 / 31.5*	42.5 / 33.3*
Ratio heating to grate surface (B)	28.5	27.0	26.7	27.7	28.0	29.0	29.3	29.6	30.8	32.2 / 25 2*	34.5 / 26.5*
Heating surface, square feet	55.0	98.0	138.0	178.0	250.0	322.0	447.0	580.0	710.0	1071 / 833*	1430 / 1111*
Grate surface, square feet (A)	1.52	2.92	4.15	5 68	7.15	8.9	12.4	15.7	18.5	26.5	33 3
Grate surface, square feet (B)	1.88	3.88	5.4	6.37	8.92	11.2	15.5	19.5	23.2	32.5	41.5
Diameter of safety valve, inches	1.5	2.25	2.50	2.75	3.0	3.25	3.5	4.2	4.0	2 of 3	2 of 4
Diameter of smoke flues, inches	7.0	10.0	11.2	12.0	15.0	17.0	19.0	23.0	25.0	28	3A
Square inches in above flues	38.5	78.5	95.0	113.0	176.7	227.0	283.5	415.5	490 9	615.7	907.9

* Water tube boilers.

A When rate of coal consumption is 10 pounds per hour each square foot grate surface.

B When rate of coal consumption is 8 pounds per hour each square foot grate surface.

Solders.

	Copper.	Tin.	Lead.	Zinc.	Silver.	Bismuth	Gold.	Cadmium.	Antimony.
Tin		25	75						
Tin		58	16			16			10
Tin, coarse, melts at 500°		33	67						
Tin, ordinary, melts at 360°		67	33						
Spelter, soft	50			50					
Spelter, hard	65			35					
Lead		33	67						
Steel	13			5	82				
Brass or Copper	50			50					
Fine Brass	47			47	6				
Pewterer's, or soft		33	45			22			
Pewterer's, or soft		50	25			25			
Plumber's pot metal		33	67						
" " coarse		25	75						
" " fine		67	33						
" " fusible		50	50						
" " very fusible		25	25			50			
Gold	4				7		89		
Gold, hard	66			34					
Gold, soft		66	34						
Silver, hard	20				80				
Silver, soft	12				67			21	
Pewter		40	20			40			
Iron	66			33					1
Copper	53	47							

Length in Feet of Joists, Scantling and Timber.

Size in Inches	12	14	16	18	20	22	24	26	28	30	42	44	45
2 x 4	8	9	11	12	13	15	16	17	19	20	28	29	30
2 x 6	12	14	16	18	20	22	24	26	28	30	42	44	45
2 x 8	16	19	21	24	27	29	32	35	37	40	53	58	60
2 x 10	20	23	27	30	33	37	40	43	47	50	70	74	75
2 x 12	24	28	32	36	40	44	48	52	56	60	84	88	90
3 x 4	12	14	16	18	20	22	24	26	28	30	42	44	45
3 x 6	18	21	24	27	30	33	36	39	42	45	63	66	68
3 x 8	24	28	32	36	40	44	48	52	56	60	84	88	90
3 x 10	30	35	40	45	50	55	60	65	70	75	105	110	113
3 x 12	36	42	48	54	60	66	72	78	84	90	126	132	135
4 x 4	16	19	21	24	27	29	32	35	37	40	56	58	60
4 x 6	24	28	32	36	40	44	48	52	56	60	84	88	90
4 x 8	32	37	43	48	53	59	64	69	75	80	112	118	120
4 x 10	40	47	53	60	67	73	80	87	93	100	140	146	150
4 x 12	48	56	64	72	80	88	96	104	112	120	168	176	180
6 x 6	36	42	48	54	60	66	72	78	84	90	126	132	135
6 x 8	48	56	64	72	80	88	96	104	112	120	168	176	180
6 x 10	60	70	80	90	100	110	120	130	140	150	210	220	225
6 x 12	72	84	96	108	120	132	144	156	168	180	250	265	270
8 x 8	64	75	85	96	107	117	128	139	149	160	224	234	240
8 x 10	80	93	107	120	133	147	160	173	187	200	280	294	300
8 x 12	96	112	128	144	160	176	192	208	224	240	336	352	360
10 x 10	100	117	133	150	167	183	200	217	233	250	350	366	375
10 x 12	120	140	160	180	200	220	240	260	280	300	420	440	450
12 x 12	144	168	192	216	240	264	288	312	336	360	504	528	540
12 x 14	168	196	224	252	280	308	336	364	392	420	588	616	630
14 x 14	196	220	261	294	327	359	392	425	457	480	686	718	735

Table Showing the Pressure of Water at Different Elevations.

Feet Head	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Inch	Feet Head.	Equals Pressure per Square Inch	Feet Head.	Equals Pressure per Square Inch.	Feet Head.	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Inch
1	.43	65	28.15	130	56.31	195	84 47	260	112.62	350	151.61
5	2 16	70	30.32	135	58.48	200	86 63	265	114 79	360	155.94
10	4 33	75	32.48	140	60.64	205	88.80	270	116.96	370	160.27
15	6.49	80	34.65	145	62.81	210	90.96	275	119.12	380	164.61
20	8.66	85	36.82	150	64.97	215	93.14	280	121.29	390	168 94
25	10.82	90	38 98	155	67.14	220	95.30	285	123.45	400	173.27
30	12 99	95	41.15	160	69.31	225	97.49	290	125 62	500	216 58
35	15.16	100	43 31	165	71.47	230	99.63	295	127.78	600	259.90
40	17.32	105	45.48	170	73.64	235	101.79	300	129.95	700	303.22
45	19 49	110	47 64	175	75.80	240	103.96	310	134.28	800	346.54
50	21.65	115	49.81	180	77.97	245	106 13	320	138.62	900	389.86
55	23.82	120	51.98	185	80.14	250	108.29	330	142 95	1,000	433.18
60	25.99	125	54.15	190	82.30	255	110.46	340	147.28	. . . . .	. . . .

Wrought-iron Welded Pipe.

DIMENSIONS, WEIGHTS, ETC., OF STANDARD SIZES FOR STEAM, GAS, WATER, OIL, ETC.

Inside Diameter.	Outside Diameter	External Circumference. A	Length of Pipe per Sq Foot of Outside Surface.	Internal Area	External Area.	Length of Pipe containing one Cubic Foot.	Weight per Foot of Length.	No. of Threads per Inch of Screw.	Contents in *Gallons per Foot.	Weight of Water per Foot of Length.
In.	In	In.	Ft.	In.	In.	Ft	Lbs.			Lbs.
⅛	.40	1.272	9.44	.012	.129	2,500	.24	27	.0006	.005
¼	.54	1 696	7.075	.049	.229	1,385.	.42	18	.0026	.021
⅜	.67	2.121	5.657	.110	.358	751.5	.56	14	.0057	.047
½	.84	2.652	4.502	.196	.554	472.4	.84	14	.0102	.085
¾	1 05	3.299	3.637	.441	.866	270.	1.12	11½	.0230	.190
1	1.31	4.134	2.903	.785	1.357	166.9	1 67	11½	.0408	.349
1¼	1.66	5.215	2.301	1 227	2 164	96.25	2.25	11½	.0638	.527
1½	1.9	5.969	2.01	1.767	2.835	70.65	2.69	11½	0918	.756
2	2.37	7.461	1.611	3.141	4.430	42.36	3.66	8	.1632	1.356
2½	2 87	9 032	1.328	4.908	6.491	30.11	5.77	8	2550	2.116
3	3 5	10 996	1.091	7.068	9.621	19 49	7.54	8	3673	3 049
3½	4	12.566	955	9 621	12 566	14.56	9.05	8	.4998	4.155
4	4 5	14 137	849	12.566	15.904	11.31	10.72	8	6528	5.405
4½	5.	15.708	765	15.904	19.635	9 03	12.49	8	.8263	6.851
5	5.56	17.475	629	19.635	24.299	7.20	14.56	8	1.020	8.500
6	6.62	20 813	577	28.274	34.471	4 98	18.76	8	1.469	12.312
7	7.62	23.954	505	38 484	45.663	3.72	23 41	8	1.999	16.662
8	8.62	27.096	.444	50.265	58.426	2.88	28 34	8	2 611	21.750
9	9 68	30.433	.394	63 617	73.715	2 26	34 67	8	3.300	27.500
10	10 75	33.772	355	78.540	90.792	1 80	40 64	8	4 081	34.000

* The Standard U. S. gallon of 231 inches.

Multiply the external circumference column, A, by 12 and the result will be the square feet of surface per lineal foot

Quantity of Brickwork in Barrel Drains and Wells.

Diameter in Clear	Thickness of Brickwork	Superficial Feet of Brickwork in One Linear Yard.	Number of Bricks Required for One Linear Yard
1 foot, 0 inches	0 feet, 4½ inches	16 feet, 6 inches	115
1 " 6 "	0 " 4½ "	21 " 2 "	148
2 " 0 "	0 " 4½ "	25 " 10 "	181
2 " 0 "	0 " 9 "	33 " 0 "	462
2 " 6 "	0 " 9 "	37 " 8 "	528
2 " 6 "	1 " 1 "	43 " 2 "	906
3 " 0 "	0 " 9 "	42 " 6 "	594
3 " 0 "	1 " 1 "	47 " 10 "	1004
3 " 6 "	0 " 9 "	47 " 1 "	659
3 " 6 "	1 " 1 "	52 " 7 "	1104
4 " 0 "	0 " 9 "	51 " 10 "	725
4 " 0 "	1 " 1 "	57 " 3 "	1203
5 " 0 "	0 " 9 "	61 " 3 "	857
5 " 0 "	1 " 1 "	66 " 9 "	1402
6 " 0 "	1 " 1 "	76 " 1 "	1597
7 " 0 "	1 " 1 "	85 " 6 "	1795

TABLE OF TREADS AND RISES.

No. of Treads.	6 Inch Rise.		6¼ Inch Rise		6½ Inch Rise.		6¾ Inch Rise.		7 Inch Rise.		7⅛ Inch Rise.		7¼ Inch Rise.		7⅜ Inch Rise.		7½ Inch Rise.		7⅝ Inch Rise.		7¾ Inch Rise.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in	ft.	in.	ft.	in.	ft.	in.
1		6		6¼		6½		6¾		7		7⅛		7¼		7⅜		7½		7⅝		7¾
2	1	0	1	0½	1	1	1	1½	1	2	1	2¼	1	2½	1	2¾	1	3	1	3¼	1	3½
3	1	6	1	6¾	1	7½	1	8¼	1	9	1	9⅜	1	9¾	1	10⅛	1	10½	1	10⅞	1	11¼
4	2	0	2	1	2	2	2	3	2	4	2	4½	2	5	2	5½	2	6	2	6½	2	7
5	2	6	2	7¼	2	8½	2	9¾	2	11	2	11⅝	3	0¼	3	0⅞	3	1½	3	2⅛	3	2¾
6	3	0	3	1½	3	3	3	4½	3	6	3	6¾	3	7½	3	8¼	3	9	3	9¾	3	10½
7	3	6	3	7¾	3	9½	3	11¼	4	1	4	1⅞	4	2¾	4	3⅝	4	4½	4	5⅜	4	6¼
8	4	0	4	2	4	4	4	6	4	8	4	9	4	10	4	11	5	0	5	1	5	2
9	4	6	4	8¼	4	10½	5	0¾	5	3	5	4⅛	5	5¼	5	6⅜	5	7½	5	8⅝	5	9¾
10	5	0	5	2½	5	5	5	7½	5	10	5	11¼	6	0½	6	1¾	6	3	6	4¼	6	5½
11	5	6	5	8¾	5	11½	6	2¼	6	5	6	6⅜	6	7¾	6	9⅛	6	10½	6	11⅞	7	1¼
12	6	0	6	3	6	6	6	9	7	0	7	1½	7	3	7	4½	7	6	7	7½	7	9
13	6	6	6	9¼	7	0½	7	3¾	7	7	7	8⅝	7	10¼	7	11⅞	8	1½	8	3⅛	8	4¾
14	7	0	7	3½	7	7	7	10½	8	2	8	3¾	8	5½	8	7¼	8	9	8	10¾	9	0½
15	7	6	7	9¾	8	1½	8	5¼	8	9	8	10⅞	9	0¾	9	2⅝	9	4½	9	6⅜	9	8¼
16	8	0	8	4	8	8	9	0	9	4	9	6	9	8	9	10	10	0	10	2	10	4
17	8	6	8	10¼	9	2½	9	6¾	9	11	10	1⅛	10	3¼	10	5⅜	10	7½	10	9⅝	10	11¾
18	9	0	9	4½	9	9	10	1½	10	6	10	8¼	10	10½	11	0¾	11	3	11	5¼	11	7½
19	9	6	9	10¾	10	3½	10	8¼	11	1	11	3⅜	11	5¾	11	8⅛	11	10½	12	0⅞	12	3¼
20	10	0	10	5	10	10	11	3	11	8	11	10½	12	1	12	3½	12	6	12	8½	12	11
21	10	6	10	11¼	11	4½	11	9¾	12	3	12	5⅝	12	8¼	12	10⅞	13	1½	13	4⅛	13	6¾
22	11	0	11	5½	11	11	12	4½	12	10	13	0¾	13	3½	13	6¼	13	9	13	11¾	14	2½
23	11	6	11	11¾	12	5½	12	11¼	13	5	13	7⅞	13	10¾	14	1⅝	14	4½	14	7⅜	14	10¼
24	12	0	12	6	13	0	13	6	14	0	14	3	14	6	14	9	15	0	15	3	15	6
25	12	6	13	0¼	13	6½	14	0¾	14	7	14	10⅛	15	1¼	15	4⅜	15	7½	15	10⅝	16	1¾
26	13	0	13	6½	14	1	14	7½	15	2	15	5¼	15	8½	15	11¾	16	3	16	6¼	16	9½
27	13	6	14	0¾	14	7½	15	2¼	15	9	16	0⅜	16	3¾	16	7⅛	16	10½	17	1⅞	17	5¼
28	14	0	14	7	15	2	15	9	16	4	16	7½	16	11	17	2½	17	6	17	9½	18	1
29	14	6	15	1¼	15	8½	16	3¾	16	11	17	2⅝	17	6¼	17	9⅞	18	1½	18	5⅛	18	8¾
30	15	0	15	7½	16	3	16	10½	17	6	17	9¾	18	1½	18	5¼	18	9	19	0¾	19	4½

No. of Treads.	7⅞ Inch Rise.		8 Inch Rise.		8¼ Inch Rise.		8½ Inch Rise.		9 Inch Rise.		9½ Inch Rise.		10 Inch Rise.		10½ Inch Rise.		11 Inch Rise.		13 Inch Rise.		14 Inch Rise.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
1		7⅞		8		8¼		8½		9		9½		10		10½		11	1	1	1	2
2	1	3¾	1	4	1	4½	1	5	1	6	1	7	1	8	1	9	1	10	2	2	2	4
3	1	11⅝	2	0	2	0¾	2	1½	2	3	2	4½	2	6	2	7½	2	9	3	3	3	6
4	2	7½	2	8	2	9	2	10	3	0	3	2	3	4	3	6	3	8	4	4	4	8
5	3	3⅜	3	4	3	5¼	3	6½	3	9	3	11½	4	2	4	4½	4	7	5	5	5	10
6	3	11¼	4	0	4	1½	4	3	4	6	4	9	5	0	5	3	5	6	6	6	7	0
7	4	7⅛	4	8	4	9¾	4	11½	5	3	5	6½	5	10	6	1½	6	5	7	7	8	2
8	5	3	5	4	5	6	5	8	6	0	6	4	6	8	7	0	7	4	8	8	9	4
9	5	10⅞	6	0	6	2¼	6	4½	6	9	7	1½	7	6	7	10½	8	3	9	9	10	6
10	6	6¾	6	8	6	10½	7	1	7	6	7	11	8	4	8	9	9	2	10	10	11	8
11	7	2⅝	7	4	7	6¾	7	9½	8	3	8	8½	9	2	9	7½	10	1	11	11	12	10
12	7	10½	8	0	8	3	8	6	9	0	9	6	10	0	10	6	11	0	13	0	14	0
13	8	6⅜	8	8	8	11¼	9	2½	9	9	10	3½	10	10	11	4½	11	11	14	1	15	2
14	9	2¼	9	4	9	7½	9	11	10	6	11	1	11	8	12	3	12	10	15	2	16	4
15	9	10⅛	10	0	10	3¾	10	7½	11	3	11	10½	12	6	13	1½	13	9	16	3	17	6
16	10	6	10	8	11	0	11	4	12	0	12	8	13	4	14	0	14	8	17	4	18	8
17	11	1⅞	11	4	11	8¼	12	0½	12	9	13	5½	14	2	14	10½	15	7	18	5	19	10
18	11	9¾	12	0	12	4½	12	9	13	6	14	3	15	0	15	9	16	6	19	6	21	0
19	12	5⅝	12	8	13	0¾	13	5½	14	3	15	0½	15	10	16	7½	17	5	20	7	22	2
20	13	1½	13	4	13	9	14	2	15	0	15	10	16	8	17	6	18	4	21	8	23	4
21	13	9⅜	14	0	14	5¼	14	10½	15	9	16	7½	17	6	18	4½	19	3	22	9	24	6
22	14	5¼	14	8	15	1½	15	7	16	6	17	5	18	4	19	3	20	2	23	10	25	8
23	15	1⅛	15	4	15	9¾	16	3½	17	3	18	2½	19	2	20	1½	21	1	24	11	26	10
24	15	9	16	0	16	6	17	0	18	0	19	0	20	0	21	0	22	0	26	0	28	0
25	16	4⅞	16	8	17	2¼	17	8½	18	9	19	9½	20	10	21	10½	22	11	27	1	29	2
26	17	0¾	17	4	17	10½	18	5	19	6	20	7	21	8	22	9	23	10	28	2	30	4
27	17	8⅝	18	0	18	6¾	19	1½	20	3	21	4½	22	6	23	7½	24	9	29	3	31	6
28	18	4½	18	8	19	3	19	10	21	0	22	2	23	4	24	6	25	8	30	4	32	8
29	19	0⅜	19	4	19	11¼	20	6½	21	9	22	11½	24	2	25	4½	26	7	31	5	33	10
30	19	8¼	20	0	20	7½	21	3	22	6	23	9	25	0	26	3	27	6	32	6	35	0

Some of the Physical Properties of Metals—Compiled from the Best Authorities.

Common Name.	Chemical Name.	Initial.	Atomic Weight.	Specific Gravity.	Weight Cubic inch.	Weight Cubic foot.	Melting Point F.	Specific Heat.	Conductivity of Heat.	Conductivity of Electricity.	Expansion 32 to 212° F.	Hardness, the Diamond.=3010.	Density.	Ductility, Gold being 1.	Malleability, Gold being 1.	Approximate price per lb. avoirdupois.
Hydrogen	Same	H.	1.													
Aluminum	Same	Al.	27.3	2.55	.0924	159.005	1160	.214	31.33			821				$ 16.30
Antimony	Stibium	Sb.	122.0	6.71	.242	418.402	842	.0508	4.03	4.6						0.36
Bismuth	Same	Bi.	207.5	9.823	.354	612.513	510	.0308	1.8	1.1	.004		10.035			1.95
Cadmium	Same	Cd.	111.6	8.60	.31	536.253	500	.0567	20.06		.0094	760	8.217			3.26
Copper	Cuprum	Cu.	63.3	8.82	.318	549.971	1930	.093	74.8	94.1	.0051	1360		6	3	0.22
Gold	Aurum	Au.	196.2	19.32	.697	1224.699	1915	.0324	54.8	73.0		979		1	1	299.72
Indium	Same	Ir.	196.7	22.12	.809	1392.999	4500	.0326				984				466.59
Iron	Ferrum	Fe.	55.9	7.8	.281	486.369	3000	.1138	10.1	15 5	.0035	1375		4	8	0.015
Lead	Plumbum	Pb.	206.4	11.37	.410	708.976	625	.0314	7 9	7.6	.0084	570	10.370	9	6	0.06
Magnesium	Same	Mg.	23.94	1.74	.628	89.791	1200	.25	34.3		.0083	726				45.30
Manganese	Same	Mn.	58.8	8.0	.289	498.84	3420	.122				1456				108.72
Mercury	Hydrargyrum	Hg.	199.8	13.58	.190	846.781	39	.0317	1.3		.0182	0				1.00
Nickel	Same	Ni.	58.6	8.80	.318	551.812	3000	.109		13.1	.0038	1410		5	9	5.80
Platinum	Same	Pt.	196.7	21.50	.777	155.887	3200	.0321	9.4	16.6	.0027	1107		3	5	122.31
Potassium	Kalium	K.	39.04	.875	.0316	54.561	110	.166				230				22.65
Silver	Argentum	Ag.	107.66	10.53	.38	656.598	1750	.056	100.00	100.0	.0056	990		2	2	18.60
Sodium	Natrium	Na.	23.0	.9735	.035	60.503	170	.293	36.5			400				3.26
Steel				7.854	.283	489.736	2550	.1165	11.6	12.0						0.025
Tin	Stannum	Sn.	117.8	7.293	.263	454.754	440	.055	15.4	11.4	.0069	651	7.025	8	4	0.25
Zinc	Same	Zn.	64.9	7.14	.258	444.215	780	.096	36.0	29 0	.0088	1077	6.480	7	7	0.10

Law of Specific Heat—In order to raise the temperature of different bodies the same number of thermometric degrees very different amounts of heat are required. The atoms of the solid element possess sensibly the same specific heat.

Ductility—The property of being drawn into wire or threads.

Malleability—The capacity of being extended in all directions by beating with the hammer.

TABLE—GIVING THE CONSTRUCTIVE DATA OF THE PRINCIPAL OFFICE BUILDINGS OF CHICAGO.

Architects.	Building.	Area.	Height	No. of Stories.	Kind of Columns.	Type of Floors.	Partitions.	Exterior Walls	Wind Bracing	Foundations
W. L. B. Jenney	Home Insurance	14,500 sq. ft.	104′ 0″	12	Cast; Keystone used in additional stories	Tile	Tile	Veneer	Cross-walls in court	Stone on 18″ of concrete
" "	Manhattan	10,040 " "	106′ 10″	16	Cast	"	"	"	Rods	Rails and beams on 12″ of concrete
" "	"The Fair"	32,000 " "	130′ 0″	9	Z bar	15″ Johnson arch	"	"	"	Rails and beams on 12″ of concrete
" "	Leiter	54,870 " "	133′ 6″	8	Cast	Tile	"	"	None	Beams on 16″ of concrete
" "	Y. M. C. A.	14,200 " "	251′ 0″ tower	13	Z bar	"	"	"	Rods	Beams on 16″ of concrete
" "	Isabella	3,450 " "	160′ 0″ to ridge	10	"	"	"	"	"	Rails and beams on 12″ of concrete
Jenney & Mundie	New York Life	11,300 " "	156′ 1″ to coping	12	Box columns of plates and angles	"	"	"	Channels in exterior walls	Beams on 12″ of concrete
" "	Fort Dearborn	6,300 " "	150′ 0″	12	Channels and plates	Soft tile	Soft tile	"	Gusset-plate knee bracing in the exterior walls	Beams on 18″ of concrete
Holabird & Roche	Tacoma	8,140 " "	166′ 0″	13	Cast	Tile	Tile	"	Cross-walls	Beams on concrete
" "	Pontiac	5,340 " "	174′ 6″	14	Z bar	"	"	"	" "	" " "
" "	Caxton	5,340 " "	150′ 6″	12	"	"	"	"	" "	" " "
" "	Venetian	5,522 " "	157′ 0″	13	"	"	"	"	Rods	" " "
" "	Katahdin Monadnock Wachusetts Monadnock	13,267 " "	203′ 0″	17	"	"	Plaster board	Solid walls, part veneer	"	" " "
" "	Old Colony	10,115 " "	213′ 0″	17	Z bar and Phœnix	"	Tile	Veneer	"	" " "
" "	Champlain	7,979 " "	189′ 0″	15	Z bar	"	"	"	"	" " "
" "	Marquette	24,190 " "	207′ 0″	10	"	"	"	"	"	Rails and beams on concrete
Adler & Sullivan	Auditorium	57,736 " "	Bldg. = 146′ Tow'r = 265′	Bldg. = 10 Tow'r = 17	Cast	"	"	Solid	Walls only	Timber grille, rails, and beams
" "	Schiller Theatre	14,400 " "	Bldg. = 112′ Tow'r = 212′	Bldg. = 13 Tow'r = 17	Z bar and Phœnix	"	Mackolite	Part solid veneer	Girders	Piles, timber grille, beams
" "	Stock Exchange	18,000 " "	173′ 0″	13	Z bar	Tile; some concrete arches used	Tile	Veneer	None	Piles and beams.
Burnham & Root	Rookery	20,760 sq. ft.	164′ 0″	12	Cast	Hard tile	"	Solid	None—solid walls only	Rails and beams.

TABLE—GIVING THE CONSTUCTIVE DATA OF THE PRINCIPAL OFFICE BUILDINGS OF CHICAGO.

Architects.	Building.	Area.	Height.	No. of Stories.	Kind of Columns.	Type of Floors.	Partitions.	Exterior Walls.	Wind Bracing.	Foundations
Burnham & Root	Monadnock	28,000 sq. ft.	215′ 0″	16	Z bar	Porous tile	Mackolite	Solid	Solid walls—portal-struts, flats in floors	Rails and beams.
" "	Great Northern Hotel	16,500 " "	168′ "	14	"	Porous tile	Tile	Veneer	Rods	Rails.
" "	Phenix	10,825 " "	160′ 0″	11	Cast	Hard tile	"	Solid	Walls only	"
" "	Woman's Temple	18,184 " "	196′ 5″	13	Z bar	Johnson's arch	"	"	" "	Rails and beams
" "	Masonic Temple	19,224 " "	273′ 0″	20	Plates and angles	Hard tile, Johnson	"	Walls carry themselves only	Rods	" " "
" "	Ashland	11,260 " "	200′ 7″	16	Z bar	New hard tile, Johnson	"	Veneer	None	Rails.
" "	Marshall Field	16,459 " "	153′ 0″	9	"	New hard tile, Johnson	"	Solid	Walls only	Rails and beams.
" "	Rand-McNally		120′ 0″	10	"	Tile	"	Veneer	Horizontal rods	" " "
D. H. Burnham & Co.	Reliance	4,675 " "	200′ 0″	14	Gray	Porous tile	Porous tile	" "	Plate girders in exterior walls	" " "
Henry Ives Cobb	Newberry Library	21,000 " "	100′ 0″	5	Larimer	Tile	Tile	Solid	None	Dimension stone
" " "	Title and Trust	11,000 " "	197′ 5″	16	Phœnix	"	"	Veneer	Bracing	Rails and concrete.
" " "	Owings	3,650 " "	170′ 0″	14	Cast	"	"	Solid	None	Dimension stone and concrete.
" " "	Chicago Athletic Association	13,680 " "	144′ 0″	10	Z bar	"	"	"	"	Beams and concrete.
" " "	Boyce	3,673 " "	149′ 0″	12	"	"	"	Veneer	Bracing	Plate girders and concrete.
" " "	Hartford	4,710 " "	173′ 0″	14	"	"	"	"	"	Beams and concrete.
Clinton J. Warren	Unity		210′ 0″	17	Cast	"	"	"	Rods	crete.
" " "	Security	4,650 " "	200′ 0″	14	Plates and angles	"	"	"		Beams and concrete.
" " "	Auditorium Annex			10	Cast	"	"	Support themselves		Beams and concrete
W. W. Boyington	Columbus				Z bar	"	"	Veneer		crete. Beams and con-
Handy & Cady.	Teutonic	4,860 " "	136′ 6″	10	Plates and channels	Terra-cotta lumber	Terra-cotta lumber	"	Knee-bracing in exterior walls	Rails and beams on concrete.

Table of greatest center loads for horizontal rectangular beams of white or yellow pine, or of spruce, 1 inch broad, supported at both ends, and required not to bend more than $\frac{1}{40}$ inch per foot of clear span, or $\frac{1}{480}$ part of the entire clear span. In practice, to allow for knots, &c, take only ⅔ rds.

This table was calculated with a constant .000325, instead of .00032 . The loads in this table include the weight of the clear beam itself; .625 of which (or ⅝ of which) must be deducted from the tabular loads to get the neat load, when the beam Is loaded at its center. When uniformly loaded, the loads will be 1.6 times as great as those in this table; but in that case the weight of the entire clear beam must be deducted. In practice this deduction need rarely be made.

Depths in Inches.	CLEAR SPANS IN FEET. (TRAUTWINE)																Depth in Ins.	Wt. of 10 ft. Lgth of Beam.
	3	4	5	6	7	8	9	10	12	14	16	18	20	25	30	35	40	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	8.4	4.8	3.0	2.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2
½	28.7	16.2	10.4	7.2	5.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	½	3
2	68.4	38.4	24.4	17.1	12.4	9.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	4
½		75	48	33	24	19	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	½	5
3	.....	130	83	58	42	32	26	21	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	6
½	.....	.....	131	92	67	51	40	33	23	.....	.....	.....	.....	.....	.....	.....	.....	½	7
4	.....	.....	196	137	100	77	60	49	34	25	.....	.....	.....	.....	.....	.....	.....	4	8
½	.....	.....	.....	192	144	108	86	70	48	36	27	.....	.....	.....	.....	.....	.....	½	9
5	.....	.....	.....	267	196	150	116	96	66	49	37	29	.....	.....	.....	.....	.....	5	10
½	.....	.....	.....	.....	260	200	156	128	89	65	50	39	32	.....	.....	.....	.....	½	11
6	.....	.....	.....	.....	336	259	204	166	115	84	64	51	41	26	.....	.....	.....	6	12
½	.....	.....	.....	.....	.....	332	260	207	148	109	83	65	52	33	23	.....	.....	½	13
7	.....	.....	.....	.....	.....	412	324	263	183	134	102	81	66	42	29	21	.....	7	14
½	.....	.....	.....	.....	.....	511	403	324	225	166	126	100	82	52	36	26	.....	½	15
8	.....	.....	.....	.....	.....	.....	484	394	273	201	154	121	98	63	44	32	24	8	16
½	.....	.....	.....	.....	.....	.....	585	475	330	241	184	145	117	74	52	38	29	½	17
9	.....	.....	.....	.....	.....	.....	692	560	389	286	219	173	140	90	62	45	35	9	18
½	.....	.....	.....	.....	.....	.....	.....	662	460	336	257	202	164	104	72	52	40	½	19
10	.....	.....	.....	.....	.....	.....	.....	769	534	392	300	237	192	123	85	63	48	10	20
½	.....	.....	.....	.....	.....	.....	.....	.....	619	454	348	274	221	141	98	71	54	½	21
11	.....	.....	.....	.....	.....	.....	.....	.....	711	522	399	316	256	163	114	83	64	11	22
½	.....	.....	.....	.....	.....	.....	.....	.....	813	597	456	361	291	185	129	93	71	½	23
12	.....	.....	.....	.....	.....	.....	.....	.....	923	678	519	410	332	212	148	108	83	12	24
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	874	669	528	420	273	188	138	105	13	26
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	1075	823	651	527	337	234	172	132	14	28
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1000	801	652	411	290	212	162	15	30
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1230	971	787	504	350	257	197	16	32
17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1175	944	604	420	309	236	17	34
18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1385	1121	717	498	365	280	18	36
20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1538	984	684	502	384	20	40
22														1309	910	668	512	22	44
24														1701	1181	867	664	24	48
26															1503	1104	845	26	52
28															1876	1378	1055	28	56
30																1695	1297	30	60

On this side of the dark lines, the safe loads of table would not bend the wooden beams as much as $\frac{1}{480}$ of their clear span.

Iron and Steel.

Average cast iron, with the same safe def will bear about 11½ as much as common yellow or white pine, or spruce; and wrought Iron 19 times as much. The same proportion of the weight of the beam itself must, however, be deducted as stated above for wood. Average steel 29 times as much as pine.

Corrosion of Steel and Iron.

C=Coefficient of Corrosion during 1 year's exposure in pounds avoirdupois per square foot. (For value of C see table.)

W=Weight in pounds of 1 foot in length of section exposed.

L=Length in feet of the perimeter exposed. If both the inside and outside perimeter are exposed to the Corrosive influence both must be included.

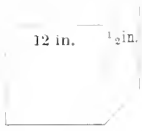
Y‡ The number of years of life of the metal.

Formula $Y=\frac{W}{C\ L}$

Table of Value of C.

Y ‡ is based on the assumption that the metal is tolerably uniform in thickness, otherwise the thin portion will have a shorter life than the rest of the section.	Corroding Agents.					
	Foul Sea Water.	Clear Sea Water.	Foul River Water.	Pure Air or Clear River Water.	Air of City Manufacturing District or Sea Water.	Sea Water of Average Foulness.
Cast Iron	.0656	.0635	.0381	.0113	.0476	.....
Wrought Iron	.1956	.1285	.1440	.0123	.1254	.....
Steel	.1914	.0970	.1133	.0125	.1252	.....
Cast Iron, planed	.2301	.0888	.0728	.0109	.0884	.....
" " galvanized	.0895	.0359	.0371	.0371	.0199	.....
" " in contact with brass						.1908
" " " " " copper						.2003
" " " " " gun metal						.3493
Best Wrought Iron in contact with brass						.2779
" " " " " " copper						.4012
" " " " " " gun metal						.4537

Example—Steel.



W=12-in. x 12-in. x ½-in. x .283=20.376 pounds.

L 1 ft. 0-in.

C .1252 from table.

$Y=\frac{W}{C\ L}=\frac{20.376}{1\times 1252}=\frac{20.376}{.1252}=$ 62.667 years.

The corrosion of steel unprotected in manufacturing districts of cities would therefore amount to 20.38 pounds in 162.67 years of the above dimensions of block of steel, or in that time it would be entirely consumed by oxidization.

NAILS REQUIRED FOR DIFFERENT KINDS OF WORK.

For 1,000 shingles, 3½ to 5 lbs. 4*d*. nails, or 3 to 3½ lbs. 3*d*.

For 1,000 laths, about 7 lbs. 3*d*. fine.

For 1,000 feet clapboards, about 18 lbs. 6*d*. box.

For 1,000 feet covering boards, about 20 lbs. 8*d*. common, or 25 lbs. 10*d*.

For 1,000 feet upper floors, square edged, about 38 lbs. 10*d*. floor, or 41 lbs. 12*d*. floor.

For 1,000 feet upper floors, matched and blind-nailed, 38 lbs. 10*d*., or 42 lbs. 12*d*. common.

For 10 feet partitions, studs or studding, 1 lb. 10*d*. common.

For 1,000 feet furring, 1x3, about 45 lbs. 10*d*. common.

For 1,000 feet furring, 1x2, about 65 lbs. 10*d*. common.

For 1,000 feet pine finish, about 30 lbs. 8*d*. finish.

For roofs and gutters use seven-pound lead; for hips and ridges, six-pound; for flashings, four-pound.

Gutters should have a fall of at least one inch in ten feet.

No sheet lead should be laid in greater length than ten or twelve feet without a dip to allow for expansion.

Joints to lead pipes require a pound of solder for every inch in diameter.

Safe Loads in Tons of 2,000 Lbs. for Hollow Rectangular Cast Iron Columns.

6 x 8 INCHES.

Thickness of Metal in Inches.

Length in Feet	⅜	½	1	1¼	1½	1¾	2
7	73	83	99	100	108	115	85
8	68	77	96	93	101	107	80
9	64	72	89	87	95	100	75
10	59	67	82	80	88	92	70
11	55	62	76	74	79	85	64
12	51	57	70	68	73	78	59
13	47	53	65	63	67	72	54
14	44	49	59	58	62	66	50
15	41	46	55	54	57	61	46
16	38	43	51	50	53	56	43
17	35	39	47	46	49	52	40
18	32	36	44	43	46	48	37
19	30	34	41	40	43	45	34
20	28	31	38	37	39	42	32

6 x 10 INCHES.

Thickness of Metal in Inches.

Length in Feet	⅜	½	1	1¼	1½	1¾	2
7	98	112	125	137	149	159	107
8	92	106	117	128	139	149	100
9	86	98	109	119	129	138	93
10	81	92	102	111	120	128	86
11	75	85	94	103	111	118	80
12	70	79	88	96	102	109	74
13	66	74	82	89	96	102	69
14	61	69	77	84	90	96	65
15	58	65	72	79	85	90	61
16	54	61	68	74	80	85	57
17	51	57	64	70	75	80	54
18	48	54	60	66	71	75	51
19	45	51	57	62	67	71	48
20	43	48	54	59	63	67	45

6 x 12 INCHES.

Thickness of Metal in Inches.

Length in Feet	⅜	½	1	1¼	1½	1¾	2
7	112	125	137	149	160	170	118
8	106	117	128	139	149	159	110
9	98	109	119	129	138	147	102
10	92	102	111	120	128	136	95
11	85	94	103	111	118	126	88
12	79	88	96	103	110	117	82
13	74	82	89	96	102	109	77
14	69	77	84	90	96	102	72
15	65	72	79	85	90	96	68
16	61	68	74	80	85	90	64
17	57	64	70	75	80	85	60
18	54	60	66	71	75	80	57
19	51	57	62	67	71	75	54
20	48	54	59	63	67	71	51

8 x 10 INCHES.

Thickness of Metal in Inches.

Length in Feet	⅜	½	1	1¼	1½	1¾	2
7	107	123	137	152	165	178	120
8	100	115	128	142	154	166	112
9	93	107	119	132	143	154	104
10	86	99	111	123	133	144	97
11	80	92	103	114	124	134	90
12	74	86	96	106	116	125	84
13	69	80	89	99	107	116	78
14	65	74	83	92	100	108	73
15	61	70	78	87	94	102	69
16	57	66	74	82	89	96	65
17	54	62	70	78	84	91	61
18	51	59	66	74	80	86	58
19	48	56	63	70	76	82	55
20	46	53	60	66	73	78	52

8 x 12 INCHES.

Thickness of Metal in Inches.

Length in Feet	⅜	½	1	1¼	1½	1¾	2
7	121	139	156	172	188	202	135
8	116	133	150	165	180	194	129
9	112	128	143	158	172	185	123
10	107	122	137	151	165	178	118
11	102	116	130	143	156	167	111
12	97	111	124	136	148	159	106
13	92	106	117	129	140	150	100
14	88	100	111	122	133	142	95
15	83	94	105	115	125	134	90
16	79	89	100	109	118	126	85
17	75	85	94	103	112	120	81
18	71	81	90	98	107	115	77
19	68	77	86	94	102	110	74
20	65	74	82	90	98	105	71

8 x 14 INCHES.

Thickness of Metal in Inches.

Length in Feet	⅜	½	1	1¼	1½	1¾	2
7	134	154	174	192	210	227	151
8	130	149	167	185	202	218	145
9	124	143	160	177	193	208	138
10	119	137	153	169	184	199	132
11	114	130	146	161	175	189	126
12	109	124	139	153	166	179	119
13	103	118	132	145	158	171	113
14	98	112	125	138	150	162	108
15	93	106	119	130	141	152	101
16	88	101	112	123	134	144	96
17	84	96	107	118	128	138	92
18	80	91	102	112	122	131	87
19	75	86	96	106	115	124	83
20	71	81	90	99	108	116	78

8 x 16 INCHES.

Thickness of Metal in Inches.

Length in Feet	⅜	½	1	1¼	1½	1¾	2
7	148	170	192	213	233	251	166
8	143	164	185	204	223	240	160
9	137	158	178	196	214	231	153
10	132	151	170	187	204	220	146
11	126	144	162	179	195	210	140
12	120	138	155	171	186	201	133
13	115	132	148	163	178	192	127
14	110	126	142	156	170	184	122
15	105	120	135	149	162	175	116
16	100	115	129	142	155	167	111
17	96	110	124	136	148	160	106
18	91	105	118	130	141	153	101
19	87	100	113	124	135	146	97
20	83	96	108	119	130	140	93

8 x 18 INCHES.

Thickness of Metal in Inches.

Length in Feet	⅜	½	1	1¼	1½	1¾	2
7	164	188	211	233	254	274	182
8	159	182	204	225	245	264	176
9	153	175	196	216	235	253	168
10	146	167	187	206	224	241	160
11	140	160	179	197	214	230	153
12	133	152	170	187	204	219	146
13	127	145	163	179	195	209	139
14	122	139	156	172	187	201	134
15	116	133	149	164	178	192	128
16	111	127	142	156	170	183	122
17	106	122	137	151	164	176	117
18	101	116	130	143	156	168	112
19	97	111	124	137	149	160	107
20	93	106	119	131	142	153	102

10 x 10 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	2¾
7	182	220	257	293	328	362	395	427
8	177	214	249	284	317	350	382	413
9	172	208	241	275	307	339	370	400
10	166	201	233	266	297	328	358	387
11	160	194	224	256	286	316	345	373
12	155	186	216	246	275	304	332	359
13	149	179	208	237	265	293	320	346
14	143	172	200	228	255	282	308	333
15	137	165	192	219	245	271	296	320
16	132	158	184	210	235	260	284	307
17	126	152	177	202	226	250	273	295
18	121	146	170	194	217	240	262	284
19	116	140	163	186	208	231	252	273
20	111	134	156	178	200	221	242	262

10 x 12 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	2¾
7	200	242	283	323	362	400	437	473
8	195	236	276	315	353	390	426	461
9	190	230	268	306	343	379	414	448
10	184	223	260	297	333	368	402	435
11	178	215	251	287	321	355	388	419
12	172	208	243	277	311	344	375	406
13	166	201	234	268	300	331	362	391
14	160	194	226	258	289	319	348	377
15	154	187	218	249	278	307	336	363
16	149	180	210	240	268	296	323	349
17	143	173	202	230	258	285	311	336
18	137	166	194	221	247	273	298	322
19	131	159	185	212	237	262	286	309
20	126	152	177	202	226	250	273	295

10 x 14 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	2¾
7	218	264	308	352	394	435	475	514
8	213	258	301	343	384	424	463	501
9	207	251	293	334	374	413	451	488
10	201	244	285	325	363	401	438	474
11	195	236	275	314	351	388	423	458
12	188	228	266	303	339	375	409	443
13	182	220	257	293	328	362	395	428
14	175	212	248	283	316	349	381	412
15	169	204	238	272	304	336	367	397
16	163	197	230	262	293	324	353	382
17	156	189	221	252	282	311	340	368
18	150	181	212	242	270	299	326	353
19	143	173	202	231	258	285	311	337
20	137	166	194	221	247	273	298	322

10 x 16 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	2¾
7	236	286	333	380	426	470	513	555
8	230	279	325	371	415	458	500	541
9	224	271	317	361	404	446	487	527
10	217	263	308	351	393	433	473	512
11	211	255	297	339	379	419	457	495
12	204	246	288	328	367	405	442	479
13	197	238	278	317	355	391	427	462
14	190	230	268	306	342	377	412	446
15	183	221	258	295	329	364	397	430
16	177	213	249	284	317	350	382	414
17	170	205	239	273	305	337	368	398
18	163	196	230	262	293	323	353	382
19	156	188	219	250	280	309	337	365
20	149	180	210	240	268	296	323	349

10 x 18 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	2¾
7	254	308	359	409	458	506	552	597
8	248	300	350	399	447	493	538	582
9	241	292	341	388	435	480	524	567
10	234	283	331	377	422	466	509	551
11	227	275	320	365	408	451	492	532
12	220	266	310	354	396	437	477	516
13	213	257	300	342	383	422	461	498
14	205	248	289	330	369	407	444	481
15	198	239	279	318	356	393	429	464
16	191	231	269	307	343	378	413	447
17	184	222	259	295	330	364	397	430
18	176	213	248	283	316	349	381	412
19	169	204	238	271	303	335	365	395
20	161	195	227	259	290	320	349	378

12 x 14 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	2¾
7	225	274	321	368	414	458	502	545
8	220	268	314	359	404	447	490	532
9	214	261	306	350	394	436	478	518
10	208	253	297	340	382	423	463	503
11	202	246	288	330	371	410	450	488
12	196	238	279	320	359	398	436	473
13	189	230	270	309	348	385	421	458
14	183	222	261	298	335	371	406	441
15	176	214	251	288	323	358	392	425
16	170	206	242	277	312	345	378	410
17	163	198	233	266	300	332	363	394
18	157	191	224	256	289	319	350	379
19	151	183	215	246	277	307	336	365
20	144	175	206	235	265	293	321	348

12 x 16 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	2¾
7	246	300	352	403	453	502	549	595
8	241	294	345	395	444	492	538	583
9	235	287	337	386	434	481	526	570
10	229	280	329	377	424	470	514	557
11	223	272	320	366	412	457	500	542
12	217	265	311	356	401	444	486	527
13	211	257	302	346	389	431	472	512
14	205	249	293	335	377	418	457	496
15	199	242	284	326	366	406	444	482
16	193	235	276	316	356	394	431	468
17	187	228	268	307	345	383	419	454
18	181	220	259	297	334	370	405	440
19	175	213	250	287	323	358	392	425
20	169	206	242	277	312	345	378	410

12 x 18 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	2¾
7	267	326	382	438	492	545	597	647
8	262	319	375	430	483	536	587	636
9	256	312	367	421	473	524	574	622
10	250	305	358	411	462	512	561	608
11	244	297	349	401	450	499	546	592
12	237	289	340	390	438	485	531	576
13	231	281	330	379	425	471	516	559
14	224	272	320	367	412	457	500	542
15	217	264	310	356	400	443	485	526
16	211	256	301	345	388	430	471	510
17	204	248	292	335	376	417	456	495
18	198	240	282	324	363	403	442	479
19	191	232	273	313	352	390	427	463
20	184	224	263	302	339	376	412	447

14 x 16 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	3
7	257	313	368	422	474	525	575	671
8	252	307	361	414	465	516	565	659
9	246	300	353	405	455	505	553	645
10	240	293	345	396	445	493	540	630
11	234	285	336	385	433	480	526	613
12	228	278	327	375	422	467	512	597
13	222	271	318	365	410	454	497	580
14	216	263	309	355	398	441	483	563
15	209	255	300	344	386	428	468	546
16	203	247	291	334	375	416	455	530
17	197	240	282	323	363	402	440	513
18	190	232	273	313	352	390	427	497
19	184	224	264	303	340	377	413	481
20	177	216	254	292	328	363	398	464

14 x 20 INCHES.

Thickness of Metal in Inches.

Length in Feet	1	1¼	1½	1¾	2	2¼	2½	3
7	279	340	399	458	514	570	624	728
8	274	333	392	449	505	560	613	715
9	267	326	383	440	494	548	600	700
10	260	318	374	430	483	536	586	684
11	254	309	365	418	470	521	570	665
12	247	301	355	407	458	507	555	648
13	241	294	345	396	445	493	540	630
14	234	285	336	385	433	480	526	613
15	227	277	326	374	420	466	510	596
16	221	268	316	362	407	452	494	577
17	214	260	307	352	395	438	479	559
18	207	252	297	340	383	424	464	542
19	200	244	287	329	370	410	449	524
20	193	235	277	317	357	396	433	506

Above tables are based on one-eighth the breaking weight, both ends of column turned square.

Safe Loads in Tons of 2,000 Lbs. for Hollow Cylindrical Cast Iron Columns.

4 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	5/8	3/4	7/8
7	16.9	19.0	20.7
8	14.7	16.4	17.9
9	12.8	14.3	15.6
10	11.2	12.4	13.5
11	9.8	10.9	11.8
12	8.7	9.6	10.3
13	7.7	8.5	9.1
14	6.9	7.5	8.1
15	6.1	6.7	7.3
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

5 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	5/8	3/4	7/8	1	1 1/8
7	27.2	31.2	34.6	37.8	40.4
8	24.5	27.9	31.0	33.6	35.9
9	22.0	25.0	27.7	30.0	31.9
10	19.7	22.4	24.7	26.7	28.4
11	17.7	20.0	22.1	23.8	25.3
12	15.9	18.0	19.8	21.3	22.7
13	14.3	16.2	17.8	19.1	20.5
14	13.0	14.6	16.0	17.2	18.2
15	11.7	13.2	14.5	15.5	16.4
16	10.7	12.0	13.1	14.0	14.8
17	9.7	10.9	12.0	12.8	13.5
18	8.9	10.0	10.9	11.6	12.4
19	8.2	9.2	10.0	10.7	11.2
20	7.5	8.4	9.2	9.8	10.1
21					
22					
23					
24					
25					

6 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
7	38.1	44.1	49.7	54.8	59.4	63.5	67.3	70.6
8	35.1	40.6	45.6	50.1	54.2	57.9	61.2	64.0
9	32.3	37.2	41.7	45.7	49.4	52.6	55.4	58.0
10	29.6	34.0	38.1	41.6	44.9	47.7	50.2	52.4
11	27.0	31.1	34.7	37.9	40.8	43.3	45.5	47.4
12	24.7	28.4	31.6	34.5	37.0	39.3	41.2	42.8
13	22.6	25.9	28.9	31.4	33.7	35.7	37.4	38.8
14	20.8	23.7	26.4	28.7	30.7	32.5	34.0	35.3
15	19.0	21.8	24.1	26.2	28.1	29.6	31.0	32.1
16	17.5	20.0	22.1	24.0	25.6	27.1	28.3	29.3
17	16.2	18.4	20.3	22.0	23.5	24.8	25.9	26.8
18	14.9	16.9	18.7	20.3	21.5	22.8	23.7	24.6
19	13.7	15.6	17.3	18.7	19.9	21.0	21.8	22.6
20	12.7	14.5	16.0	17.3	18.4	19.3	20.2	20.8
21								
22								
23								
24								
25								

7 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
7	49.1	57.3	65.0	72.2	78.9	85.1	90.9	96.3
8	46.0	53.7	60.8	67.4	73.5	79.2	84.4	89.1
9	43.0	50.0	56.6	62.6	68.2	73.4	78.1	82.3
10	40.1	46.6	52.6	58.1	63.2	67.8	72.0	75.8
11	37.3	43.2	48.7	53.7	58.4	62.5	66.3	69.8
12	34.6	40.1	45.1	49.7	53.9	57.6	61.1	64.1
13	32.1	37.1	41.7	45.9	49.7	53.1	56.2	59.0
14	29.8	34.4	38.6	42.4	45.9	49.0	51.8	54.2
15	27.7	31.9	35.8	39.2	42.4	45.2	47.7	49.8
16	25.7	29.6	33.1	36.3	39.2	41.8	44.0	46.0
17	23.9	27.6	30.7	33.7	36.3	38.6	40.7	42.5
18	22.2	25.5	28.5	31.2	33.6	35.8	37.7	39.2
19	20.7	23.8	26.5	29.0	31.2	33.2	34.9	36.4
20	19.3	22.1	24.7	27.0	29.0	30.8	32.4	33.8
21								
22								
23								
24								
25								

8 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4
7	70.4	80.3	89.7	98.6	106.9	114.8	122.2	135.5
8	66.8	76.1	84.9	93.2	100.9	108.2	115.0	127.3
9	63.2	71.9	80.1	87.7	94.9	101.7	107.9	119.1
10	59.6	67.7	75.3	82.4	89.0	95.2	100.9	111.1
11	56.0	63.5	70.6	77.2	83.3	88.9	94.2	103.4
12	52.6	59.6	66.1	72.2	77.8	83.0	87.7	96.1
13	49.3	55.8	61.8	67.4	72.6	77.3	81.7	89.8
14	46.2	52.2	57.8	62.9	67.7	72.0	76.0	82.9
15	43.2	48.8	54.0	58.7	63.1	67.1	70.7	77.0
16	40.5	45.7	50.4	54.8	58.9	62.5	65.8	71.6
17	37.9	42.7	47.2	51.2	54.9	58.4	61.4	66.6
18	35.5	40.0	44.1	47.9	51.3	54.4	57.2	62.0
19	33.3	37.5	41.3	44.8	47.9	50.8	53.4	57.8
20	31.2	35.1	38.7	41.9	44.8	47.5	49.9	53.9
21	29.3	33.0	36.3	39.3	42.0	44.4	46.6	50.4
22	27.6	30.9	34.0	36.8	39.4	41.6	43.7	47.1
23	25.9	29.1	32.0	34.6	37.0	39.1	41.0	44.1
24	24.4	27.4	30.1	32.5	34.7	36.7	38.4	41.4
25	23.0	25.8	28.3	30.6	32.7	34.5	36.2	38.9

9 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	2
7	83.5	95.5	107.1	118.1	128.6	148.1	165.7	181.4
8	80.0	91.5	102.4	112.9	122.8	141.1	157.5	172.0
9	76.4	87.3	97.6	107.5	116.8	134.0	149.3	162.6
10	72.8	83.0	92.8	102.0	110.8	126.8	140.9	153.3
11	69.1	78.8	87.9	96.6	104.8	119.7	132.8	144.1
12	65.5	74.6	83.2	91.3	98.9	112.8	124.8	135.3
13	62.0	70.5	78.6	86.2	93.2	106.1	117.2	126.8
14	58.6	66.6	74.1	81.2	87.8	99.7	110.0	118.7
15	55.4	62.9	69.9	76.5	82.6	93.7	103.2	111.3
16	52.3	59.3	65.9	72.0	77.8	88.6	96.7	104.1
17	49.3	55.9	62.1	67.8	73.1	82.6	90.7	97.5
18	46.6	52.7	58.5	63.8	68.8	77.6	85.1	91.[illegible]
19	43.9	49.7	55.1	60.1	64.8	73.0	79.9	85.6
20	41.5	46.9	52.0	56.7	61.0	68.6	75.0	80.[illegible]
21	39.2	44.3	49.0	53.4	57.4	64.6	70.5	75.4
22	37.0	41.8	46.3	50.4	54.2	60.8	66.3	70.9
23	35.0	39.5	43.7	47.6	51.1	57.3	62.4	66.6
24	33.2	37.4	41.3	44.9	48.2	54.1	58.9	62.8
25	31.4	35.4	39.1	42.5	45.6	51.0	55.5	59.3

10 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2
7	101.2	124.3	150.1	173.9	195.7	215.5	233.4	249.5
8	97.8	119.8	144.5	167.2	187.8	206.5	223.3	238.3
9	94.1	115.2	138.7	160.2	179.6	197.2	212.9	226.8
10	90.3	110.4	132.7	153.0	171.3	187.7	202.3	215.3
11	86.5	105.5	126.6	145.7	162.9	178.2	191.8	203.7
12	82.7	100.6	120.6	138.6	154.6	168.9	181.5	192.4
13	78.9	95.8	114.6	131.5	146.6	159.8	171.4	181.5
14	75.1	91.2	108.9	124.7	138.7	151.0	161.7	171.0
15	71.5	86.6	103.3	118.1	131.2	142.6	152.5	161.0
16	68.0	82.2	97.9	111.8	124.0	134.6	143.7	151.5
17	64.6	78.0	92.8	105.8	117.1	127.0	135.4	142.6
18	61.3	74.0	87.8	100.0	110.6	119.8	127.6	134.2
19	58.2	70.2	83.2	94.6	104.5	113.0	120.3	126.4
20	55.3	66.6	78.8	89.5	98.8	106.7	113.4	119.0
21	52.5	63.1	74.7	84.7	93.4	100.8	107.0	112.3
22	49.9	59.9	70.8	80.2	88.3	95.2	101.0	105.8
23	47.4	56.8	67.2	76.0	83.6	90.0	95.4	99.8
24	45.1	54.0	63.7	72.0	79.1	85.1	90.2	94.3
25	42.9	51.3	60.4	68.3	75.0	80.8	85.5	89.1

11 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4
7	141.3	171.1	199.5	225.5	249.6	271.7	291.8	310.1
8	137.1	166.1	193.1	218.0	240.9	261.9	281.0	298.2
9	132.6	160.4	186.3	210.0	231.8	251.7	269.7	285.8
10	127.9	154.6	179.2	201.8	222.4	241.2	258.1	273.3
11	123.1	148.6	172.0	193.4	212.9	230.5	246.3	260.4
12	118.2	142.5	164.7	185.0	203.4	219.9	234.6	247.7
13	113.4	136.4	157.5	176.6	193.9	209.4	223.1	235.3
14	108.5	130.5	150.4	168.4	184.6	199.1	211.9	223.1
15	103.8	124.6	143.4	160.4	175.6	189.1	201.0	211.4
16	99.2	118.9	136.7	152.7	166.9	179.5	190.6	200.3
17	94.7	113.3	130.2	145.2	158.5	170.3	180.6	189.7
18	90.3	108.0	123.9	138.0	150.5	161.5	171.1	179.[illegible]
19	86.1	102.9	117.9	131.2	142.9	153.2	162.1	169.7
20	82.1	98.0	112.1	124.6	135.6	145.2	153.5	160.[illegible]
21	78.3	93.3	106.7	118.5	128.8	137.8	145.6	152.1
22	74.6	88.9	101.5	112.6	122.3	130.7	137.9	144.0
23	71.2	84.6	96.6	107.0	116.2	124.0	130.8	136.5
24	67.9	80.6	91.9	101.8	110.4	117.8	124.1	129.4
25	64.8	76.9	87.5	96.9	104.9	111.9	117.8	122.7

12 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4
7	158.2	192.5	224.8	255.1	283.4	309.7	334.0	356.4
8	154.2	187.5	218.7	247.9	275.1	300.4	323.6	345.0
9	149.9	182.1	212.2	240.3	266.4	290.4	312.6	332.9
10	145.3	176.4	205.3	232.3	257.2	280.1	301.1	320.3
11	140.6	170.5	198.3	224.0	247.7	269.5	289.4	307.5
12	135.8	164.5	191.0	215.6	238.2	258.8	277.6	294.6
13	131.0	158.4	183.8	207.2	228.6	248.1	265.8	281.6
14	126.1	152.3	176.5	198.8	219.0	237.5	254.1	269.1
15	121.3	146.3	169.4	190.4	209.6	227.0	242.7	256.7
16	116.5	140.4	162.3	182.3	200.5	216.8	231.5	244.6
17	111.8	134.6	155.4	174.4	191.5	207.0	220.7	233.0
18	107.2	128.9	148.7	166.7	182.9	197.4	210.3	221.8
19	102.7	123.4	142.2	159.2	174.6	188.2	200.4	211.1
20	98.4	118.1	136.0	152.1	166.6	179.4	190.8	200.8
21	94.3	113.0	130.0	145.2	158.9	171.0	181.7	191.1
22	90.3	108.1	124.2	138.7	151.6	163.0	173.1	181.8
23	86.4	103.4	118.7	132.4	144.6	155.4	164.8	173.1
24	82.8	99.0	113.5	126.5	138.0	148.2	157.1	164.8
25	79.2	94.7	108.5	120.8	131.7	141.3	149.7	156.9

13 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4
7	174.9	213.4	250.0	284.5	317.0	347.4	375.9	402.4
8	171.1	208.7	244.2	277.7	309.1	338.6	366.0	391.5
9	167.0	203.5	238.0	270.3	300.7	329.0	355.4	379.8
10	162.6	198.0	231.3	262.6	291.8	319.0	344.2	367.6
11	158.2	192.3	224.4	254.5	282.6	308.6	332.7	354.9
12	153.4	186.4	217.3	246.2	273.1	298.0	320.9	342.0
13	148.6	180.4	210.1	237.8	263.5	287.2	309.0	329.0
14	143.7	174.3	202.8	229.4	253.9	276.4	297.1	316.0
15	138.9	168.2	195.6	220.9	244.3	265.7	285.4	303.3
16	134.0	162.2	188.4	212.5	234.8	255.2	273.7	290.6
17	129.2	156.2	181.2	204.3	225.5	244.8	262.4	278.3
18	124.4	150.3	174.2	196.2	216.4	234.7	251.3	266.4
19	119.8	144.6	167.4	188.4	207.5	224.9	240.6	254.7
20	115.2	139.0	160.8	180.7	198.9	215.4	230.2	243.5
21	110.8	133.5	154.4	173.4	190.6	206.2	220.2	232.8
22	106.6	128.3	148.1	166.2	182.6	197.4	210.7	222.5
23	102.4	123.2	142.2	159.4	175.0	189.0	201.5	212.6
24	98.4	118.3	136.4	152.8	167.6	180.9	192.8	203.3
25	94.6	113.6	130.9	146.5	160.5	173.2	184.4	194.[illegible]

14 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4
7	191.5	234.2	274.9	313.6	350.3	384.9	417.6	448.2
8	187.9	229.7	269.4	307.2	342.8	376.5	408.2	437.8
9	184.0	224.8	263.5	300.2	334.8	367.4	398.0	426.6
10	179.8	219.6	257.2	292.7	326.2	357.7	387.2	414.7
11	175.4	214.0	250.5	284.9	317.2	347.6	375.9	402.2
12	170.9	208.2	243.5	276.8	307.9	337.1	364.3	389.[illegible]
13	166.1	202.3	236.4	268.5	298.4	326.5	352.5	376.[illegible]
14	161.3	196.3	229.2	260.0	288.9	315.7	340.6	363.[illegible]
15	156.5	190.2	221.9	251.6	279.2	304.9	328.6	350.5
16	151.6	184.2	214.6	243.1	269.6	294.1	316.7	337.5
17	146.7	178.1	207.4	234.7	260.0	283.4	305.0	324.8
18	141.9	172.1	200.2	226.4	250.6	272.9	293.4	312.3
19	137.1	166.2	193.2	218.2	241.4	262.6	282.2	300.0
20	132.4	160.3	186.2	210.2	232.3	252.6	271.2	288.0
21	127.8	154.6	179.5	202.4	223.5	242.9	260.5	276.5
22	123.3	149.1	172.9	194.8	215.0	233.4	250.2	265.4
23	118.9	143.7	166.5	187.5	206.7	224.3	240.2	254.[illegible]
24	114.7	138.4	160.3	180.4	198.8	215.5	230.6	244.3
25	110.6	133.3	154.3	173.5	191.1	207.0	221.4	234.4

15 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4
7	208.0	254.9	299.7	342.6	383.4	422.2	459.0	493.8
8	204.6	250.6	294.5	336.4	376.3	414.2	450.0	483.9
9	200.9	245.9	288.9	329.8	368.6	405.5	440.3	473.1
10	196.9	240.9	282.8	322.6	360.4	396.2	429.9	461.7
11	192.6	235.5	276.3	315.1	351.7	386.4	419.0	449.6
12	188.2	230.0	269.6	307.2	342.7	376.2	407.6	437.2
13	183.6	224.2	262.6	299.0	333.4	365.7	396.0	424.[illegible]
14	178.9	218.3	255.5	290.7	323.9	355.0	384.1	411.[illegible]
15	174.1	212.3	248.3	282.3	314.2	344.2	372.2	398.[illegible]
16	169.2	206.2	241.0	273.8	304.6	333.3	360.1	385.1
17	164.4	200.1	233.7	265.3	294.9	322.5	348.2	372.0
18	159.5	194.0	226.5	256.9	285.3	311.8	336.4	359.1
19	154.6	188.0	219.2	248.5	275.8	301.2	324.7	346.4
20	149.8	182.0	212.1	240.3	266.5	290.8	313.2	333.[illegible]
21	145.1	176.1	205.1	232.2	257.3	280.6	302.0	321.8
22	140.4	170.3	198.2	224.2	248.3	270.6	291.1	309.[illegible]
23	135.9	164.7	191.5	216.5	239.6	260.9	280.5	298.4
24	131.4	159.2	185.0	209.0	231.1	251.5	270.2	287.[illegible]
25	127.0	153.8	178.6	201.7	222.9	242.4	260.2	276.[illegible]

16 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
7	275.4	324.4	371.4	416.3	459.3	500.2	539.1	576.0
8	271.4	319.5	365.6	409.6	451.7	491.7	529.7	565.7
9	266.9	314.1	359.2	402.3	443.4	482.4	519.4	554.5
10	262.1	308.2	352.3	394.4	434.4	472.4	508.4	542.4
11	256.9	302.0	345.0	386.0	424.9	461.8	496.7	529.7
12	251.5	295.5	337.4	377.2	415.0	450.8	484.6	516.4
13	245.9	288.7	329.5	368.1	404.8	439.4	472.0	502.6
14	240.1	281.8	321.3	358.8	394.3	427.7	459.1	488.6
15	234.2	274.6	313.0	349.3	383.5	415.8	446.1	474.4
16	228.2	267.4	304.6	339.7	372.7	403.8	432.9	460.2
17	222.1	260.1	296.1	330.0	361.9	391.8	419.7	445.8
18	216.0	252.8	287.6	320.3	351.0	379.8	406.6	431.6
19	209.9	245.5	279.1	310.6	340.2	367.8	393.6	417.5
20	203.9	238.3	270.7	301.1	329.5	356.1	380.8	403.6
21	197.9	231.1	262.4	291.7	319.0	344.5	368.1	390.0
22	191.9	224.1	254.2	282.4	308.7	333.1	355.7	376.6
23	186.1	217.1	246.2	273.3	298.5	322.0	343.6	363.6
24	180.4	210.3	238.3	264.4	288.6	311.1	331.8	351.0
25	174.8	203.6	230.6	255.7	279.0	300.6	320.4	338.6

17 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
7	295.9	349.0	400.0	449.1	496.2	541.2	584.2	625.3
8	292.0	344.3	394.5	442.7	488.9	533.1	575.3	615.5
9	287.7	339.1	388.4	435.7	481.0	524.2	565.4	604.7
10	283.1	333.5	381.8	428.2	472.4	514.6	554.9	593.1
11	278.2	327.5	374.8	420.1	463.3	504.4	543.6	580.8
12	273.0	321.2	367.5	411.6	453.7	493.8	531.8	567.8
13	267.5	314.7	359.8	402.8	443.7	482.6	519.5	554.4
14	261.9	307.9	351.8	393.6	433.4	471.1	506.9	540.6
15	256.1	300.9	343.6	384.3	422.8	459.4	494.0	526.6
16	250.1	293.8	335.3	374.7	412.1	447.5	480.9	512.3
17	244.1	286.5	326.8	365.1	401.3	435.5	467.7	498.0
18	238.1	279.2	318.4	355.4	390.4	423.4	454.5	483.6
19	232.0	271.9	309.8	345.7	379.5	411.4	441.3	469.[illegible]
20	225.9	264.6	301.3	336.0	368.7	399.4	428.2	455.[illegible]
21	219.8	257.4	292.9	326.4	358.0	387.5	415.2	441.1
22	213.8	250.2	284.5	316.9	347.3	375.8	402.5	427.[illegible]
23	207.8	243.0	276.3	307.6	336.9	364.3	389.9	413.7
24	201.9	236.0	268.2	298.3	326.6	353.0	377.6	400.[illegible]
25	196.1	229.1	260.2	289.3	316.6	342.0	365.6	387.[illegible]

18 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
7	316.2	373.4	428.6	481.7	532.9	582.0	629.2	674.4
8	312.5	368.9	423.3	475.7	526.0	574.3	620.6	665.0
9	308.5	364.0	417.5	469.0	518.4	565.8	611.2	654.7
10	304.1	358.7	411.2	461.7	510.2	556.6	601.1	643.5
11	299.3	352.9	404.5	454.0	501.4	546.8	590.2	631.6
12	294.3	346.8	397.3	445.8	492.1	536.5	578.8	619.1
13	289.0	340.5	389.9	437.2	482.4	525.6	566.8	606.1
14	283.5	333.8	382.1	428.3	472.4	514.4	554.5	592.6
15	277.8	327.0	374.1	419.1	462.0	502.9	541.8	578.7
16	272.0	320.0	365.9	409.7	451.4	491.2	528.9	564.6
17	266.1	312.9	357.6	400.2	440.7	479.2	515.7	550.[illegible]
18	260.1	305.6	349.1	390.5	429.9	467.2	502.5	535.[illegible]
19	254.0	298.4	340.6	380.8	419.0	455.1	489.3	521.[illegible]
20	247.9	291.0	332.1	371.1	408.1	443.0	476.0	507.3
21	241.8	283.7	323.6	361.4	397.2	431.0	462.9	492.[illegible]
22	235.7	276.5	315.1	351.8	386.4	419.1	449.8	478.7
23	229.7	269.2	306.7	342.2	375.7	407.3	437.0	464.8
24	223.7	262.1	298.4	332.8	365.2	395.7	424.3	451.1
25	217.7	255.0	290.2	323.5	354.8	384.2	411.8	437.6

19 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
7	336.5	397.8	457.0	514.2	569.5	622.7	673.9	723.1
8	333.0	393.4	452.0	508.5	562.9	615.4	665.8	714.[illegible]
9	329.1	388.8	446.4	502.1	555.7	607.3	656.8	704.4
10	324.9	383.7	440.4	495.1	547.8	598.4	647.1	693.7
11	320.3	378.2	433.9	487.7	539.4	589.0	636.6	682.[illegible]
12	315.5	372.3	427.0	479.8	530.4	579.0	625.5	670.1
13	310.4	366.1	419.8	471.4	521.0	568.5	613.9	657.4
14	305.0	359.7	412.2	462.8	511.2	557.5	601.9	644.[illegible]
15	299.5	353.0	404.4	453.8	501.0	546.3	589.4	630.[illegible]
16	293.8	346.2	396.4	444.6	490.7	534.7	576.7	616.7
17	288.0	339.1	388.2	435.2	480.1	522.9	563.8	602.[illegible]
18	282.0	332.0	379.8	425.6	469.3	511.0	550.6	588.[illegible]
19	276.0	324.8	371.4	416.0	458.5	498.9	537.4	573.9
20	269.9	317.5	362.9	406.3	447.6	486.8	524.1	559.4
21	263.8	310.2	354.4	396.6	436.7	474.7	510.8	545.0
22	257.7	302.9	345.9	386.8	425.8	462.7	497.6	530.7
23	251.7	295.6	337.4	377.2	414.9	450.7	484.5	516.4
24	245.6	288.3	329.0	367.6	404.2	438.8	471.6	502.4
25	239.6	281.1	320.6	358.1	393.6	427.1	458.7	488.5

20 INCH DIAMETER. Thickness of Metal in Inches.

Length in Feet	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
7	356.8	422.1	485.4	546.7	606.0	663.3	718.6	771.9
8	353.4	418.0	480.6	541.2	599.7	656.3	710.8	763.3
9	349.7	413.5	475.3	535.0	592.8	648.5	702.2	753.9
10	345.6	408.6	469.5	528.4	585.2	640.0	692.8	743.6
11	341.2	403.2	463.2	521.2	577.1	630.9	682.8	732.6
12	336.5	397.6	456.6	513.5	568.4	621.3	672.1	720.[illegible]
13	331.6	391.6	449.6	505.5	559.3	611.1	660.8	708.5
14	326.4	385.4	442.3	497.1	549.8	600.4	649.1	695.7
15	321.0	378.9	434.6	488.3	539.9	589.4	636.9	682.4
16	315.5	372.2	426.8	479.3	529.7	578.1	624.4	668.7
17	309.7	365.3	418.7	470.0	519.3	566.5	611.7	654.[illegible]
18	303.9	358.3	410.5	460.6	508.7	554.7	598.7	640.[illegible]
19	298.0	351.1	402.2	451.1	498.0	542.8	585.5	626.3
20	292.0	343.9	393.7	441.4	487.1	530.7	572.3	611.9
21	285.9	336.6	385.2	431.7	476.2	518.6	559.0	597.4
22	279.8	329.3	376.7	422.0	465.3	506.5	545.7	583.[illegible]
23	273.7	322.0	368.2	412.3	454.4	494.4	532.4	568.6
24	267.6	314.7	359.7	402.6	443.5	482.4	519.3	554.[illegible]
25	261.5	307.4	351.2	393.0	432.7	470.4	506.2	540.1

Above tables are based on one-eighth the breaking weight, both ends of column turned square.

Safe Loads in Tons of 2,000 Lbs. for Hollow Square Cast Iron Columns.

Length in Feet	4x4 Inches ⅝	4x4 Inches ¾	5x5 Inches ⅝	¾	⅞	1	1⅛	1¼
7	24.5	27.6	38.1	43.8	48.9	53.4	57.3	60.8
8	21.7	24.4	34.9	40.0	44.5	48.4	51.9	54.8
9	19.2	21.5	31.8	36.3	40.3	43.8	46.8	49.4
10	17.1	19.0	29.0	33.0	36.6	39.6	42.2	44.5
11	15.2	16.9	26.4	30.0	33.1	35.8	38.1	40.1
12	13.5	15.0	24.0	27.2	30.0	32.4	34.4	36.1
13	12.1	13.4	21.9	24.8	27.3	29.4	31.2	32.6
14	10.8	12.0	20.0	22.6	24.8	26.7	28.3	29.6
15	9.8	10.8	18.2	20.6	22.6	24.3	25.7	26.8

Length in Feet	6x6 Inches ⅝	¾	⅞	1	1⅛	1¼	1⅜	1½
7	52.1	60.5	68.2	75.4	81.9	87.9	93.2	98.0
8	48.7	56.5	63.6	70.1	76.0	81.4	86.2	90.5
9	45.4	52.5	59.0	65.0	70.3	75.1	79.4	83.2
10	42.2	48.7	54.7	60.0	64.8	69.0	73.0	76.3
11	39.1	45.1	50.5	55.4	59.7	63.6	67.0	69.9
12	36.3	41.7	46.6	51.1	55.0	58.4	61.4	64.1
13	33.6	38.6	43.1	47.1	50.6	53.7	56.4	58.7
14	31.1	35.7	39.8	43.4	46.6	49.4	51.8	53.8
15	28.8	33.0	36.7	40.0	42.9	45.4	47.6	49.4
16	26.7	30.6	34.0	37.0	39.6	41.9	43.8	45.5
17	24.8	28.3	31.4	34.2	36.6	38.6	40.4	41.9
18	23.0	26.3	29.1	31.7	33.8	35.7	37.3	38.7
19	21.4	24.4	27.1	29.4	31.4	33.1	34.5	35.7
20	19.9	22.7	25.2	27.3	29.2	30.7	32.0	33.1

Length in Feet	7x7 Inches ⅝	¾	⅞	1	1⅛	1¼	1⅜	1½
7	66.1	77.2	87.7	97.6	106.8	115.5	123.5	130.9
8	62.7	73.2	83.1	92.3	100.9	108.9	116.3	123.1
9	59.4	69.2	78.4	87.0	95.0	102.3	109.1	115.3
10	56.1	65.2	73.8	81.8	89.1	95.8	102.0	107.7
11	52.7	61.3	69.3	76.6	83.4	89.6	95.2	100.4
12	49.6	57.5	64.9	71.7	77.9	83.6	88.7	93.4
13	46.5	53.9	60.8	67.0	72.7	77.9	82.6	86.5
14	43.6	50.5	56.8	62.6	67.9	72.6	76.9	80.8
15	40.9	47.3	53.1	58.5	63.3	67.7	71.6	75.1
16	38.3	44.3	49.7	54.6	59.0	63.1	66.6	69.8
17	35.9	41.4	46.5	51.0	55.1	58.8	62.1	65.0
18	33.7	38.8	43.5	47.7	51.5	54.9	57.9	60.6
19	31.6	36.4	40.7	44.6	48.1	51.3	54.0	56.5
20	29.6	34.1	38.2	41.8	45.0	47.9	50.5	52.7

Length in Feet	8x8 Inches ¾	⅞	1	1⅛	1¼	1⅜	1½	1¾
7	93.8	107.0	119.7	131.7	143.0	153.7	163.8	182.1
8	90.0	102.6	114.6	125.9	136.6	146.7	156.1	173.2
9	86.0	98.0	109.3	120.0	130.1	139.5	148.3	164.2
10	82.0	93.3	104.0	114.0	123.4	132.2	140.4	155.1
11	78.0	88.6	98.7	108.1	116.8	125.0	132.6	146.1
12	74.0	84.0	93.4	102.2	110.4	118.0	125.0	137.5
13	70.1	79.5	88.3	96.5	104.1	111.2	117.7	129.1
14	66.4	75.2	83.4	91.1	98.1	104.7	110.7	121.5
15	62.7	71.0	78.7	85.8	92.4	98.5	104.0	113.7
16	59.3	67.0	74.2	80.9	87.0	92.6	97.7	106.7
17	56.0	63.3	70.0	76.2	81.9	87.1	91.8	100.0
18	52.9	59.7	66.0	71.8	77.1	81.9	86.3	93.9
19	50.0	56.4	62.2	67.6	72.6	77.1	81.1	88.1
20	47.2	53.2	58.7	63.8	68.4	72.6	76.3	82.8
21	44.6	50.3	55.4	60.1	64.4	68.3	71.8	77.8
22	42.2	47.5	52.3	56.8	60.8	64.4	67.7	73.3
23	39.9	44.9	49.5	53.6	57.4	60.7	63.8	69.0
24	37.8	42.5	46.8	50.7	54.2	57.4	60.2	65.0
25	35.8	40.2	44.3	47.9	51.2	54.2	56.9	61.3

Length in Feet	9x9 Inches ¾	⅞	1	1⅛	1¼	1½	1¾	2
7	110.1	126.2	141.5	156.2	170.3	196.5	220.2	241.4
8	106.6	121.9	136.7	150.8	164.2	189.2	211.6	231.6
9	102.7	117.5	131.6	145.0	157.8	181.5	202.7	221.5
10	98.8	112.9	126.4	139.1	151.3	173.6	193.6	211.1
11	94.6	108.2	121.0	133.1	144.6	165.7	184.4	200.7
12	90.8	103.5	115.7	127.1	138.0	157.8	175.3	190.5
13	86.8	98.9	110.4	121.2	131.4	150.0	166.3	180.5
14	82.8	94.3	105.1	115.4	125.0	142.5	157.7	170.8
15	78.9	89.8	100.1	109.7	118.8	135.1	149.3	161.5
16	75.2	85.5	95.2	104.2	112.7	128.1	141.3	152.6
17	71.6	81.3	90.4	99.0	107.0	121.3	133.7	144.1
18	68.1	77.3	85.9	94.0	101.5	114.9	126.4	136.1
19	64.8	73.5	81.6	89.2	96.2	108.8	119.6	128.6
20	61.6	69.8	77.5	84.6	91.3	103.1	113.1	121.4
21	58.6	66.4	73.6	80.3	86.6	97.7	107.0	114.8
22	55.7	63.1	69.9	76.3	82.2	92.6	101.3	108.6
23	53.0	60.0	66.4	72.4	78.0	87.8	96.0	102.7
24	50.5	57.0	63.2	68.8	74.0	83.2	90.9	97.3
25	48.0	54.3	60.1	65.4	70.3	79.0	86.2	92.1

Length in Feet	10x10 Inches ¾	⅞	1	1¼	1½	1¾	2	2¼
7	126.3	145.0	163.1	197.3	228.9	258.0	284.5	308.6
8	122.9	141.1	158.6	191.6	222.0	249.8	275.2	298.1
9	119.3	136.8	153.7	185.5	214.6	241.2	265.3	287.0
10	115.5	132.4	148.6	179.1	206.9	232.3	255.1	275.6
11	111.6	127.8	143.4	172.5	199.1	223.1	244.7	263.9
12	107.6	123.2	138.1	165.9	191.1	213.9	234.2	252.3
13	103.6	118.5	132.7	159.2	183.1	204.7	223.9	240.7
14	99.5	113.8	127.3	152.5	175.3	195.5	213.6	229.4
15	95.6	109.1	122.1	146.0	167.5	186.6	203.5	218.3
16	91.6	104.6	116.9	139.6	160.0	178.0	193.8	207.6
17	87.8	100.1	111.8	133.4	152.6	169.6	184.5	197.3
18	84.0	95.8	106.9	127.4	145.5	161.5	175.5	187.5
19	80.4	91.6	102.2	121.6	138.8	153.8	166.9	178.1
20	76.9	87.6	97.6	116.0	132.2	146.4	158.6	169.1
21	73.6	83.7	93.3	110.7	126.0	139.4	150.9	160.7
22	70.3	80.0	89.1	105.6	120.1	132.7	143.5	152.6
23	67.3	76.4	85.1	100.8	114.5	126.3	136.5	145.0
24	64.3	73.1	81.5	96.1	109.1	120.3	129.8	137.9
25	61.5	69.8	77.6	91.8	104.1	114.6	123.6	131.1

Length in Feet	11x11 Inches ¾	1	1¼	1½	1¾	2	2¼	2½
7	142.3	184.5	224.1	261.1	295.5	327.3	356.7	383.6
8	139.1	180.2	218.7	254.5	287.8	318.5	346.7	372.5
9	135.7	175.6	212.9	247.5	279.5	308.1	336.1	360.7
10	132.1	170.7	206.7	240.1	270.9	299.1	324.9	348.3
11	128.3	165.7	200.3	232.4	261.9	288.9	313.4	335.6
12	124.4	160.4	193.8	224.5	252.7	278.4	301.7	322.7
13	120.4	155.1	187.1	216.6	243.5	267.9	290.0	309.7
14	116.4	149.7	180.4	208.6	234.2	257.4	278.2	296.8
15	112.3	144.4	173.8	200.6	225.0	247.0	266.7	284.2
16	108.3	139.0	167.2	192.7	215.9	236.6	255.3	271.8
17	104.3	133.8	160.6	185.0	207.0	226.7	244.2	259.7
18	100.4	128.6	154.3	177.5	198.4	217.0	233.5	248.0
19	96.6	123.6	148.1	170.2	190.0	207.6	223.1	236.8
20	92.9	118.7	142.1	163.1	181.9	198.5	213.2	226.0
21	89.3	113.9	136.2	156.2	174.0	189.8	203.6	215.6
22	85.8	109.4	130.6	149.6	166.5	181.4	194.4	205.7
23	82.4	104.9	125.2	143.3	159.3	173.4	185.7	196.3
24	79.1	100.7	120.0	137.2	152.4	165.8	177.4	187.3
25	76.0	96.6	115.1	131.4	145.9	158.5	169.4	178.8

Length in Feet	12x12 Inches 1	1¼	1½	1¾	2	2¼	2½	2¾
7	205.7	250.6	292.9	332.6	369.8	404.5	436.6	466.3
8	201.7	245.5	286.8	325.4	361.5	395.1	426.1	454.7
9	197.3	240.0	280.1	317.6	352.5	384.9	414.8	442.3
10	192.7	234.2	273.0	309.3	343.0	374.1	402.8	429.1
11	187.8	228.0	265.6	300.6	333.0	363.0	390.4	415.4
12	182.7	221.6	257.9	291.6	322.7	351.4	377.6	401.4
13	177.5	215.1	250.0	282.4	312.3	339.6	364.6	387.3
14	172.2	208.4	242.1	273.1	301.7	327.8	351.6	373.0
15	166.8	201.7	234.1	263.8	291.1	316.0	338.5	358.9
16	161.4	195.0	226.1	254.5	280.6	304.3	325.7	344.9
17	156.1	188.4	218.1	245.4	270.2	292.7	313.0	331.1
18	150.8	181.8	210.3	236.3	260.0	281.4	300.6	317.7
19	145.5	175.3	202.6	227.5	250.0	270.3	288.5	304.6
20	140.4	169.0	195.1	218.8	240.2	259.5	276.7	292.0
21	135.4	162.8	187.8	210.4	230.8	249.2	265.4	279.7
22	130.5	156.7	180.6	202.2	221.7	239.0	254.4	268.0
23	125.7	150.9	173.7	194.3	212.8	229.3	243.9	256.7
24	121.1	145.2	167.1	186.7	204.3	220.0	233.8	245.9
25	116.6	139.8	160.7	179.4	196.2	211.0	224.1	235.5

Length in Feet	13x13 Inches 1	1¼	1½	1¾	2	2¼	2½	2¾
7	226.7	276.9	324.5	369.6	412.0	452.0	489.4	524.3
8	222.9	272.1	318.7	362.7	404.2	443.1	479.4	513.3
9	218.8	266.9	312.4	355.3	395.6	433.4	468.6	501.4
10	214.4	261.3	305.7	347.4	386.5	423.1	457.1	488.7
11	209.7	255.4	298.5	339.0	376.9	412.2	445.1	475.4
12	204.8	249.3	291.1	330.3	366.9	401.0	432.6	461.7
13	199.7	242.9	283.4	321.3	356.6	389.4	419.7	447.6
14	194.5	236.4	275.6	312.1	346.1	377.7	406.7	433.4
15	189.2	229.7	267.6	302.8	335.6	365.8	393.6	419.0
16	183.8	223.0	259.6	293.5	324.9	353.9	380.5	404.7
17	178.5	216.3	251.5	284.2	314.3	342.1	367.4	390.5
18	173.1	209.6	243.6	274.9	303.8	330.4	354.5	376.5
19	167.8	203.0	235.6	265.8	293.5	318.8	341.9	362.8
20	162.5	196.4	227.8	256.8	283.3	307.5	329.5	349.3
21	157.3	190.0	220.2	247.9	273.3	296.4	317.3	336.2
22	152.2	183.7	212.7	239.3	263.6	285.6	305.6	323.5
23	147.2	177.5	205.4	230.9	254.1	275.1	294.1	311.1
24	142.3	171.4	198.2	222.7	244.9	265.0	283.1	299.2
25	137.5	165.6	191.3	214.7	236.0	255.2	272.4	287.8

Length in Feet	14x14 Inches 1	1¼	1½	1¾	2	2¼	2½	2¾
7	247.6	303.1	355.9	406.2	454.0	499.2	541.8	582.0
8	244.1	298.6	350.5	399.8	446.6	490.8	532.4	571.6
9	240.2	293.6	344.5	392.8	438.5	481.6	522.2	560.3
10	236.0	288.3	338.1	385.2	429.8	471.7	511.2	548.1
11	231.5	282.7	331.3	377.2	420.5	461.3	499.5	535.3
12	226.8	276.7	324.1	368.8	410.9	450.5	487.4	521.9
13	221.8	270.6	316.6	360.0	400.9	439.1	474.8	508.1
14	216.8	264.2	308.9	351.0	390.6	427.5	462.0	494.0
15	211.6	257.7	301.1	341.9	380.1	415.8	448.9	479.6
16	206.3	251.0	293.1	332.6	369.5	403.9	435.8	465.2
17	200.9	244.3	285.1	323.3	358.8	391.9	422.6	450.8
18	195.5	237.6	277.1	313.9	348.2	380.0	409.4	436.5
19	190.2	230.9	269.0	304.6	337.6	368.2	396.4	422.3
20	184.8	224.2	261.1	295.4	327.2	356.5	383.5	408.3
21	179.5	217.6	253.2	286.2	316.8	345.0	370.9	394.5
22	174.2	211.1	245.4	277.2	306.6	333.7	358.5	381.1
23	169.0	204.7	237.8	268.4	296.7	322.6	346.3	367.9
24	163.9	198.4	230.4	259.8	286.9	311.8	334.5	355.1
25	158.9	192.2	223.0	251.4	277.5	301.3	323.0	342.7

Length in Feet	15x15 Inches 1	1¼	1½	1¾	2	2¼	2½	2¾
7	268.4	329.1	387.2	442.7	495.7	546.1	594.0	639.4
8	265.1	324.9	382.0	436.7	488.7	538.2	585.1	629.5
9	261.4	320.2	376.4	430.0	481.0	529.5	575.4	618.8
10	257.4	315.1	370.3	422.8	472.7	520.1	564.9	607.1
11	253.1	309.7	363.7	415.1	463.9	510.1	553.7	594.8
12	248.5	304.0	356.7	407.0	454.6	499.5	542.0	581.8
13	243.8	298.0	349.6	398.5	444.8	488.6	529.7	568.3
14	238.9	291.8	342.1	389.8	434.8	477.3	517.2	554.6
15	233.8	285.5	334.5	380.8	424.5	465.7	504.3	540.4
16	228.6	279.0	326.6	371.6	414.1	453.9	491.2	526.1
17	223.3	272.3	318.7	362.4	403.5	442.0	478.1	511.6
18	218.0	265.7	310.7	353.0	392.8	430.1	464.8	497.1
19	212.6	258.9	302.6	343.7	382.1	418.1	451.6	482.7
20	207.2	252.2	294.6	334.3	371.5	406.2	438.4	468.3
21	201.9	245.5	286.6	325.0	360.9	394.4	425.4	454.1
22	196.5	238.9	278.6	315.8	350.5	382.7	412.6	440.1
23	191.2	232.3	270.8	306.7	340.2	371.2	399.9	426.4
24	186.0	225.8	263.0	297.8	330.0	359.9	387.5	413.0
25	180.8	219.4	255.4	289.0	320.1	348.9	375.4	399.8

Length in Feet	16x16 Inches 1¼	1½	1¾	2	2¼	2½	2¾	3
7	355.0	418.3	479.0	537.2	592.8	645.9	696.5	744.5
8	351.0	413.4	473.3	530.6	585.4	637.5	687.2	734.3
9	346.6	408.1	467.0	523.3	577.1	628.3	677.0	[illegible]
10	341.7	402.2	460.1	515.4	568.1	618.3	665.9	710.9
11	336.6	396.0	452.8	506.9	558.5	607.6	654.0	698.0
12	331.1	389.4	445.0	498.0	548.4	596.2	641.5	684.3
13	325.3	382.4	436.8	488.6	537.8	584.4	628.5	670.0
14	319.3	375.2	428.3	478.9	526.8	572.1	615.0	655.3
15	313.1	367.7	419.6	468.8	515.5	559.5	601.1	640.1
16	306.8	360.0	410.6	458.5	503.9	546.7	586.9	624.7
17	300.3	352.2	401.4	448.1	492.1	533.6	572.6	609.1
18	293.7	344.2	392.2	437.5	480.2	520.4	558.1	593.3
19	287.0	336.2	382.9	426.8	468.2	507.1	543.5	577.5
20	280.3	328.2	373.4	416.1	456.2	493.8	529.0	561.8
21	273.6	320.1	364.1	405.4	444.3	480.6	514.6	546.1
22	266.8	312.1	354.7	394.8	432.4	467.5	500.2	530.6
23	260.2	304.1	345.5	384.3	420.6	454.5	486.1	515.3
24	253.5	296.2	336.3	373.9	409.0	441.7	472.1	500.2
25	247.0	288.4	327.2	363.6	397.5	429.1	458.4	485.4

Length in Feet	17x17 Inches 1¼	1½	1¾	2	2¼	2½	2¾	3
7	380.8	449.3	515.2	578.6	639.8	697.7	753.4	806.6
8	377.0	444.7	509.8	572.3	632.3	689.7	744.5	797.0
9	372.8	439.6	503.8	565.4	624.4	680.9	734.9	786.2
10	368.2	434.0	497.2	557.9	615.9	671.4	724.3	774.7
11	363.3	428.0	490.2	549.7	606.7	661.1	712.9	762.2
12	358.0	421.7	482.7	541.1	597.0	650.2	700.9	749.0
13	352.5	415.0	474.8	532.1	586.7	638.8	688.3	735.2
14	346.7	407.9	466.6	522.6	576.1	626.9	675.1	720.8
15	240.6	400.7	458.1	512.9	565.0	614.6	661.6	706.0
16	334.4	393.2	449.3	502.8	553.7	601.9	647.7	690.9
17	328.1	385.5	440.4	492.5	542.1	589.1	633.5	675.4
18	321.6	377.7	431.2	482.1	530.3	576.0	619.1	659.8
19	315.0	369.8	422.0	471.5	518.4	562.8	604.6	644.0
20	308.3	361.6	412.6	460.8	506.4	549.5	590.1	628.1
21	301.6	353.8	403.3	450.1	494.4	536.2	575.5	612.3
22	294.9	345.7	293.9	439.4	482.4	522.9	560.9	596.6
23	288.2	337.7	384.5	428.8	470.5	509.7	546.5	580.9
24	281.5	329.6	375.2	418.2	458.6	496.6	532.2	565.4
25	274.8	321.7	366.0	407.7	446.9	483.6	518.1	550.1

Length in Feet	18x18 Inches 1¼	1½	1¾	2	2¼	2½	2¾	3
7	406.5	480.1	551.2	619.8	685.8	749.2	810.1	868.5
8	402.9	475.8	546.1	613.8	679.0	741.7	801.8	859.3
9	398.9	470.9	540.4	607.3	671.6	733.3	792.5	849.2
10	394.5	465.6	534.1	600.1	663.4	724.2	782.4	838.1
11	389.8	459.9	527.4	592.3	654.6	714.4	771.5	826.1
12	384.8	453.8	520.2	584.1	645.3	703.9	759.9	813.4
13	379.4	447.4	512.7	575.3	635.4	692.9	747.8	800.1
14	373.8	440.6	504.7	566.2	625.1	681.3	735.0	786.2
15	368.0	433.5	496.4	556.7	614.3	669.4	727.8	771.7
16	361.9	426.3	487.9	546.9	603.3	657.0	708.2	756.9
17	355.7	418.8	479.1	536.8	591.9	644.4	694.3	741.7
18	349.4	411.1	470.2	526.6	580.3	631.5	680.1	726.2
19	342.9	403.3	461.0	516.1	568.6	618.4	665.7	710.5
20	336.3	395.4	451.8	505.5	556.7	605.2	651.2	694.7
21	329.6	387.4	442.5	494.9	544.7	591.9	636.6	678.9
22	322.9	379.4	433.1	484.2	532.7	578.6	622.0	663.0
23	316.2	371.3	423.7	473.5	520.7	565.3	607.4	647.1
24	309.5	363.2	414.3	462.8	508.7	552.0	592.9	631.4
25	302.8	355.2	405.0	452.1	496.7	538.8	578.5	615.7

Length in Feet	19x19 Inches 1¼	1½	1¾	2	2¼	2½	2¾	3
7	432.1	510.9	587.1	660.9	732.0	800.6	866.7	930.2
8	428.7	506.8	582.3	655.2	725.6	793.4	858.7	921.5
9	424.9	502.2	576.9	648.9	718.5	785.4	849.9	911.8
10	420.7	497.1	570.9	642.1	710.7	776.8	840.3	901.2
11	416.2	491.6	564.5	634.7	702.3	767.3	829.8	889.7
12	411.4	485.8	557.5	626.7	693.3	757.3	818.7	877.5
13	406.2	479.5	550.2	618.3	683.8	746.6	806.9	864.7
14	400.8	473.0	542.6	609.5	673.8	735.5	794.6	851.2
15	395.2	466.2	534.6	600.3	663.4	723.9	781.8	837.1
16	389.3	459.1	526.3	590.8	652.6	711.7	768.5	822.6
17	383.2	451.8	517.7	580.9	641.5	699.5	754.9	807.7
18	377.0	444.3	508.9	570.9	630.2	686.9	741.0	792.5
19	370.7	436.6	500.0	560.6	618.6	674.0	726.8	777.0
20	364.2	428.9	490.8	550.1	606.8	660.9	712.4	761.4
21	357.6	421.0	481.6	539.6	594.9	647.7	697.9	745.5
22	351.0	413.0	472.3	529.0	583.0	634.4	683.3	729.7
23	344.3	404.9	462.9	518.3	571.0	621.1	668.7	713.7
24	337.6	396.9	453.5	507.5	558.9	607.7	654.0	697.8
25	330.8	388.8	444.1	496.8	546.9	594.4	639.4	682.0

Length in Feet	20x20 Inches 1¼	1½	1¾	2	2¼	2½	2¾	3
7	457.7	541.6	623.0	701.8	778.1	851.9	923.1	991.8
8	454.5	537.7	618.4	696.5	772.0	845.0	915.5	983.5
9	450.8	533.3	613.2	690.5	765.2	837.4	907.1	974.3
10	446.8	528.4	607.5	683.9	757.8	829.1	897.8	964.0
11	442.5	523.2	601.3	676.8	749.7	820.1	887.9	953.1
12	437.8	517.6	594.7	669.2	741.1	810.4	877.2	941.3
13	432.9	511.6	587.6	661.1	731.9	800.2	865.8	928.9
14	427.7	505.3	580.2	652.6	722.3	789.4	853.9	915.9
15	422.2	498.7	572.5	643.6	712.1	778.1	841.5	902.2
16	416.5	491.8	564.4	634.4	701.7	766.4	828.6	888.1
17	410.6	484.7	556.1	624.8	690.9	754.4	815.3	873.6
18	404.6	477.4	547.5	615.0	679.8	742.0	801.6	858.6
19	398.3	469.9	538.7	604.9	668.4	729.3	787.7	843.4
20	392.0	462.2	529.8	594.6	656.9	716.5	773.5	827.9
21	385.5	454.4	520.6	584.2	645.1	703.4	759.1	812.2
22	378.9	446.5	511.4	573.7	633.2	690.2	744.6	796.4
23	372.3	438.6	502.1	563.0	621.3	676.9	730.0	780.5
24	365.6	430.5	492.8	552.3	609.3	663.6	715.3	764.6
25	358.9	422.5	483.4	541.6	597.2	650.2	700.7	748.6

Above tables are based on one-eighth the breaking weight, both ends of column turned square.

WOODEN BEAMS.

Table of safe quiescent loads for horizontal rectangular beams one inch thick, supported at both ends, the load equally distributed.

SPAN IN FEET	DEPTH OF BEAM IN INCHES.										
	6	7	8	9	10	11	12	13	14	15	16
5	800	1090	1420	1800	2220	2690	3200	3750	4350	5000	5690
6	670	910	1180	1500	1850	2240	2670	3130	3630	4170	4740
7	570	780	1010	1290	1590	1920	2280	2680	3110	3570	4060
8	500	680	890	1120	1390	1680	2000	2350	2720	3130	3560
9	440	600	790	1000	1210	1490	1780	2090	2420	2780	3160
10	400	540	710	900	1110	1340	1600	1880	2180	2500	2840
11	360	490	650	820	1010	1220	1450	1710	1980	2270	2590
12	330	450	590	750	930	1120	1330	1560	1810	2080	2370
13	310	420	550	690	850	1030	1230	1440	1680	1920	2190
14	290	390	510	640	790	960	1140	1340	1560	1790	2030
15	270	360	470	600	740	900	1070	1250	1450	1670	1900
16	250	340	440	560	690	840	1000	1170	1360	1560	1780
17	230	320	420	530	650	790	940	1100	1280	1470	1670
18	220	300	400	500	620	750	890	1040	1210	1390	1580
19	210	290	380	470	590	710	840	990	1150	1320	1500
20	200	270	360	450	560	670	800	940	1090	1250	1420
21	190	260	340	430	530	640	760	890	1040	1190	1350
22	180	250	320	410	500	610	730	850	990	1140	1290
23	170	240	300	390	480	580	700	810	950	1090	1230
24	160	230	290	370	460	560	670	780	910	1040	1180
25	160	220	280	350	440	540	640	750	870	1000	1130
26	150	210	270	340	420	520	610	720	840	960	1090
27	150	200	260	330	400	500	590	690	810	920	1050
28	140	190	250	320	490	480	570	670	780	890	1010
29	140	190	250	310	380	460	550	650	750	860	980
30	130	180	240	300	370	450	530	630	730	830	950

This table has been calculated for extreme fiber strain of 1,000 lbs. per square inch, giving a safety of 6 in ordinary building timber of fair quality.

Oak and yellow pine will carry a load one-fourth greater.

When more accuracy is required the weight of the beam itself must be deducted.

Care must be taken to let the beams rest for a sufficient distance on their supports to guard against crushing at the ends, especially in placing very heavy loads upon short, but deep and strong beams.

FORMULAE FOR ASCERTAINING STRENGTH OF BEAMS.

To ascertain the strength of a beam of any given size, or materials, multiply its width (in inches) by the square of the depth (in inches) and divide by the span (in feet)—multiply the quotient by the constant (co-efficient of strength) of material used, and the result will be the breaking load.

In ordinary practice a sixth of the "breaking" would be a "safe load."

$$\text{Center breaking load in lbs.} = \frac{\text{Width in inches} \times \text{sq. of depth in inches}}{\text{Clear span in feet}} \times \text{constant*}$$

Example: To ascertain the safe centre load in lbs. for a white pine beam 8 inches wide, 12 inches deep, 16 feet clear span.

$$\frac{\text{Width (in inches)} \times \text{square of depth (in inches)}}{\text{Clear span (in feet)}} \times \frac{\text{constant*}}{\text{factor of safety.}}$$

or

$$\frac{8 \times 144}{16} \times \frac{450*}{6} = 5{,}400 \text{ lbs.}$$

* Constants or transverse strengths in lbs. for center loads are:

American white pine.....450 lbs.

American yellow pine.....550 lbs.

American white oak.....600 lbs.

Constants are for loads at rest.

Where beam is loaded at the center to get neat load, deduct $\frac{1}{2}$ weight of beam.

Where beam is uniformly loaded the strength is double, to get neat load deduct entire weight of beam.

LIMES, CEMENTS, PLASTERS.

Limes and Cements.—Natural limes and cements are produced by calcining limestones and other calcareous materials, in which process the carbonic acid and moisture they contain are driven off.

Hydraulic Limes are calcined from stone containing 13 to 92 per cent. of carbonate of lime, and a portion of clay, also soluble silica, carbonate of magnesia, alkalies, metallic oxides, and sulphates.

Cements.—There is no precise line between hydraulic limes and cements, the latter containing a larger proportion of clay than limes.

Natural Cements are calcined from stones containing carbonate of lime, a mixture of carbonate of lime and magnesia, together with a proportion of from 30 to 50 per cent. of clay. More than 40 per cent. of clay is injurious to the cements.

Hydraulic Cements are artificial cements made in a similar manner to hydraulic lime, but with a larger proportion of clay, silica, alumina, magnesia, etc. They do not slack after calcination, and some set under water at a temperature of 65 degrees in from 3 to 5 minutes and others in as many hours.

Portland Cement is an artificial cement. Good cement should be ground very fine, and should weigh from 95 to 130 pounds to the striked bushel. Slow setting cement is strongest. It is very important that sand used with cement be perfectly clean and sharp.

Mortar is lime and sand mixed with water. The setting process is a chemical change, the lime and the carbonic acid in the air combining to form a carbonate of lime, which as a cementing element encloses and binds together the particles of sand. The sand should be perfectly free from clay, loam or other impurities, or substitutes for sand may be used in the shape of well burnt clay, coriae from iron-works, slag from furnaces and cinders from coals.

Gypsum, or hydrated sulphate of lime is the basis of most plasters. It is a soft stone, which is either simply calcined, or calcined and combined with salts and alkalies.

Plaster of Paris is gypsum gently calcined till nearly the whole of the moisture is driven off. It can be cast in almost any form in wax or guttapercha moulds. It is also used with other plasters to quicken the setting.

Keene's Cement is plaster of paris soaked in a solution of alum and recalcined.

Parian Cement is gypsum calcined and powdered and mixed with a solution of borax, recalcined, ground, and mixed with a solution of alum.

Coarse Stuff is lime water mixed with hair or fiber.

Fine Stuff is lime slaked to a paste run to the consistency of cream, and allowed to harden to the required consistency for working by evaporation.

Gauged Stuff is plaster of paris added in the proportion of about 1 to 4 for its more rapid setting.

Rough Cast is washed gravels mixed with hot hydraulic lime: it is thrown with large trowels in a semi-fluid state upon an even surface of coarse stuff, and colored with lime wash and ochre.

Depeter is a "pricked up" coat of coarse stuff, into which small stone are pressed while in a wet state.

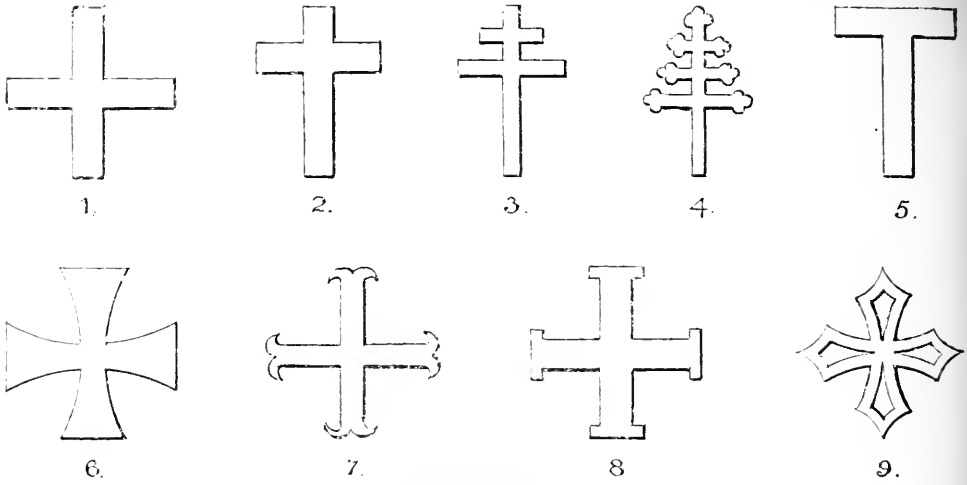
Depretor is plaster finished with a surface similar to cooled stone.

Pugging is coarse stuff put between floors for the purpose of deafening.

Papier Mache is paper reduced to a pulp or sheets of paper glued together and pressed in a metal mould to a required form.

Carton Pierre is similar to papier mache, but made with paper pulp, whiting and size, pressed into plaster moulds.

Fibrous Plaster is plaster of Paris in a thin coat laid on canvas strained on framework.



CROSSES.

The cross, a symbol of Christianity, has very naturally been extensively used in the monuments of the middle ages. When the two branches of the cross are equal in length, as in Fig. 1, the cross is called a Greek cross, and when the stem is longer than the arms, as in Fig. 2, it is a Roman or Latin cross. When the figure has two arms, one longer than the other, as in Fig. 3 (the upper one meant as a representation of the inscription which was placed over the head of Christ) it is known by the name of the Lorraine cross, and has received that name from its being a bearing in the arms of the Dukes of Lorraine. By heralds this is called a patriarchal cross. The next cross, whose arms are triple, as Fig. 4, is the papal cross, and is one of the emblems of the papacy, signifying, perhaps, like the triple crown or tiara, the triple sovereignty over the universal church, the suffering church and the triumphant church. The great majority of the western churches, with transepts, are constructed in the form of the Latin cross, those in the form of the Greek cross being very rare. Those in the form of the Lorraine cross are still rarer, and rarer are those constructed with triple transepts. There is another form called the truncated or tau cross, as Fig. 5, having the form of that letter, on which, as a plan, a few churches have been built. Considered as respects the contour, the cross in blason has been variously shaped and named. Thus, Fig. 6, in which the extremities widen as they recede from the center, is called a cross patee. This is met with more frequently than any of the others. It is seen in the nimbus, on tombs, on shields, upon coins, etc.; and is the usual form of the dedication cross found in religious structures. Fig. 7 is by the French called ancree, the extremities forming hooks, but by heralds it is called the cross moline. Crosses flory are those in which the ends are formed into trefoils, as is seen in Fig. 4, the papal cross above mentioned. Fig. 8 is a cross potent, and Fig. 9 is the cross clechee, as respects the outer lines of its form; when it is voided, as shown by the inner lines, the ground or field is seen on which it lies.

MEASUREMENT OF OLD BRICKS.

Uncleaned rough from building dumped from 8-10.
Uncleaned stacked on out-side and interior filled promiscuously, 10-12.
Cleaned and stacked, 16-18.
Cleaned, stacked on outside and interior filled promiscuously, 12-14.

RULE FOR CALCULATING PROPORTIONED WIDTH AND HEIGHT OF THREADS AND RISES OF STAINS.

Subtract the width of tread from 24 in. and the result will be twice the height of the riser. Thus: if the tread is 10 in. wide, then $24 - 10 = 14 \div 2 = 7$ in., the height or riser proportionate to a 10 in. tread. This is exclusive of nosings.

MEMORANDA FOR PAINTERS.

(From "Builders' Guide and Price Book.")

Painters' work is generally estimated by the yard, and the cost depends upon the number of coats applied, besides the quality of the work, and the material to be painted.

One coat or priming, will take, for 100 yards of painting, twenty pounds of lead and four gallons of oil. Two-coat work, forty pounds of lead and four gallons of oil. Three-coat work, the same proportionate quantity as two coats; so that a fair estimate for 100 yards of three-coat would be 100 pounds of lead and sixteen gallons of oil.

One gallon priming oil color will cover 50 superficial yards.

One pound of paint covers about four superficial yards the first coat, and about six each additional coat. One pound of putty, for stopping every twenty yards.

One gallon of tar and one pound of pitch will cover twelve yards superficial the first coat, and seventeen yards each additional coat.

A day's work on the outside of a building is 100 yards of first coat, and 80 yards of either second or third coat. An ordinary door, including casings, will, on both sides, make eight to ten yards of painting, or about five yards to a door without casings. An ordinary window makes about two and one-half or three yards.

RULE FOR FINDING THE REQUIRED AREA FOR ANY CHIMNEY.

Multiply the nominal horse-power of the boiler by 112, and divide the product by the square root of the height of the chimney in feet. The quotient will be the required area in inches, at the top of chimney.

Table showing diameter and height of chimney for any boiler:

Horse-Power of Boiler.	Height of Chimney in feet.	Interior Diameter at top.	Horse-Power of Boiler.	Height of Chimney in feet.	Interior Diameter at top.
10	60	14 in	70	120	30 in.
12	75	14 "	90	120	34 "
16	90	16 "	120	135	38 "
20	99	17 "	160	150	43 "
30	105	21 "	200	165	47 "
50	120	26 "	250	180	52 "
60	120	27 "	380	195	57 "

WEIGHT OF BRICKWORK.

Placing the weight of brickwork at 112 lb. per cubic foot, the weights per superficial foot for different walls are:

9 inch wall..... 84 lb.
13 inch wall..... 121 lb.
18 inch wall..... 168 lb.
22 inch wall..... 205 lb.
26 inch wall..... 243 lb.

CONTRAST OF COLORS.

White—Black and all colors.
Yellow—Violet, lavender, white.
Red—Green, olive.
Blue—Orange, auburn, brown.
Orange—Blue, gray.
Violet—Yellow, citrine, buff, dun.
Green—Red, russet, maroon, chocolate, citrine, purple, violet, lavender.
Russet, Maroon, Chocolate } Green, olive.
Gray—Orange, auburn, brown.
Olive—Red, russet, maroon, chocolate.

Centers—The following is the method to find the radius for arch centers S = span R = rise

Then $\left\{ \frac{\left(\frac{S}{2}\right)^2}{R} + R \right\} \div 2$ or: To the square of half the span divided by the rise, add the rise and divide this sum by 2, and the result will be the radius required.

Example:—Suppose an arch 20 feet span and 5 feet rise then:

$$\left\{ \frac{10^2}{5} + 5 \right\} \div 2 = \frac{20 + 5}{2} = 12 \text{ ft. } 6 \text{ in. the radius required.}$$

IRON GIRDERS.

The equal corresponding weight in the center of a girder caused by a certain ascertained weight coming at any other point of the same girder.

W = Known Weight.
L = The whole length between the bearings.
D = Distance between resting point of W and the furthest support.
D' = Distance between resting point of W and the nearest support.
E = Half the distance between the supports.
x = The equal corresponding weight or strain in the center.

Then $x = \frac{W\,E}{D}$

Example.—Let A B be a girder 12 ft. long with a girder resting on it 4 ft. from A with a known resultant weight of 5 tons, then x or strain at C (center)

$$= \frac{5 \times 6}{8} \text{ or } 3\tfrac{3}{4} \text{ tons.}$$

To resolve the weight W into the two concurrent parallel forces at A and B, or the resultant weight or strain at the bearings. Taking the above example.

Strain at B $= \frac{W\,D'}{L}$ or $\frac{5 \times 4}{12} = 1\tfrac{2}{3}$ tons. Strain at A $= \frac{W\,D}{L}$ or $\frac{5 \times 8}{12}$ or $3\tfrac{1}{3}$ tons.

When a beam is fixed at one end only, and has to support a weight uniformly distributed over the length the form of equal strength is a triangle, supposing the beam to be everywhere the same, but if the section of beam be circular, then the form of equal strength will be a semi-cubic parabola.

A cast iron girder if made too deep will be too rigid, and a comparatively small impulsive force will break it, the outline of the compressed side or top flange of a C. I. girder if to bear a weight uniformly distributed should be an arch the radius of which equals the square of half the length divided by the depth or

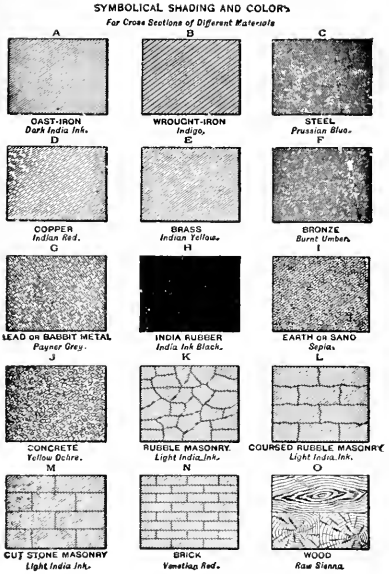
$\left(\frac{L}{2}\right)^2 \div d$ where L = length of Girder between the bearings.
d = depth of Girder.

If the depth is obliged to be uniform then the outline of the breadth should be formed by setting two parabolas base to base, their verticals being in the middle of the length.

HINTS ABOUT PAINTING IRON.

Before painting iron, it should be thoroughly scraped, brushed and cleaned from all scale or rust.

Lead paints should not be applied to iron, as they erode the surface of the metal instead of protecting it. Oxide of iron paint is found both theoretically and practically to be anti-corrosive.



PAPER.

24 sheets = 1 quire.
20 sheets = 1 quire outsides.
25 sheets = 1 quire printers.
20 quires = 1 ream.
21½ quires = 1 ream printers'.
2 reams = 1 bundle.
10 reams = 1 bale.
60 skins = 1 roll of parchment.

WEIGHTS AND MEASURES.

LINEAL MEASURE.

2¼ inches = 1 nail.
4 inches = 1 hand.
3 inches = 1 palm.
9 inches = 1 span.
12 inches = 1 foot.
45 inches = 1 ell.
3 feet = 1 yard.
6 feet = 1 fathom.
16½ feet or 5½ yards = 1 rod, pole, or perch.
4 poles or 22 yards = 1 chain.
220 yards or 40 poles = 1 furlong.
1760 yards or 8 furlongs = 1 mile.
7.92 inches = 1 link.
100 links or 66 ft. = 1 chain.
10 chains = 1 furlong.
80 chains = 1 mile.
3 miles = 1 league.

LENGTH OF A FOOT IN DIFFERENT COUNTRIES.

	Inches.		Inches.
Spain	11.03	Denmark	12.35
Holland	11.14	Prussia	12.36
Sweden	11.14	Austria	12.45
America	12	Portugal	12.96
England	12	Russia	13.75

LENGTH OF A MILE IN DIFFERENT COUNTRIES.

	Am. yards.		Am. yards.
Russian	1,100	Spanish	5,028
Italian	1,467	German	5,866
English	1,760	Swedish and Danish	7,233
American	1,760	Hungarian	8,630
Scotch	1,984	Norwegian	12,400
Irish	2,200	French league	3,666
Polish	4,400		

SQUARE MEASURE.

144 square inches = 1 square foot.
9 square feet = 1 square yard.
$272\frac{1}{4}$ feet = 1 square rod or pole.
40 rods = 1 square rood.
4 roods, 160 rods, 4,840 yards, 43,560 feet, 10 square chains = 1 acre.
640 acres = 1 square mile.
2.471 acres = 1 hectare.
7,840 square yards = 1 Irish acre.
6150 square yards = 1 Scotch acre.
30 square acres = 1 yard of land.
100 acres = 1 hide of land.
40 hides = 1 barony.

SOLID OR CUBIC MEASURE.

1728 cubic inches = 1 cubic foot.
27 cubic feet = 1 cubic yard.
40 cubic feet of rough or 50 cubic feet of hewn timber = 1 ton or load.
108 cubic feet = 1 stack of wood.
128 cubic feet = 1 cord of wood.

AVOIRDUPOIS WEIGHT.

16 drachms = 1 ounce.
16 ounces = 1 pound.
28 pounds = 1 quarter.
112 pounds = 1 cwt.
20 cwt. = 1 ton.

TROY WEIGHT.

24 grains = 1 dwt.
20 dwt. = 1 oz.
12 oz. = 1 lb.

DRY MEASURE.

2 gallons = 1 peck.
8 gallons = 1 bushel.
64 gallons = 1 quarter.
1 bushel = 1.28 cubic feet.

LIQUID MEASURE.

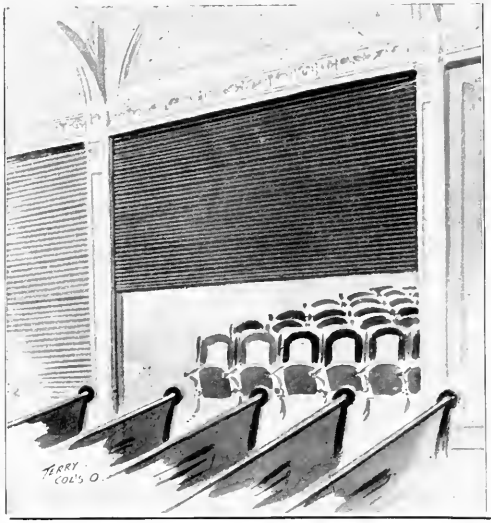
8.665 cubic inches = 1 gill.
4 gills = 1 pint.
2 pints = 1 quart.
1 quarts = 1 gallon.
1 gallon U. S. = 8.34 lb.
1 gallon U. S. = 231 cubic inches.
1 cubic foot = 7.48 U. S. gallons.

SIZES OF PAPER (Whatman's).

	Inches.		Inches.
Emperor	72 x 48	Royal	24 x 19
Antiquarian	53 x 31	Medium	22 x $17\frac{1}{2}$
Double elephant	40 x $26\frac{3}{4}$	Demy	20 x $15\frac{1}{2}$
Atlas	34 x 26	Large post	$20\frac{3}{4}$ x $16\frac{3}{4}$
Colombier	$34\frac{1}{2}$ x $23\frac{1}{2}$	Post	19 x $15\frac{1}{4}$
Imperial	30 x 22	Foolscap	17 x $13\frac{1}{2}$
Elephant	28 x 23	Post	15 x $12\frac{1}{2}$
Super royal	27 x 19	Copy	20 x 16

TABLE OF SQUARE ROOTS.

No.	Sq. Root.	No.	Sq. Root.	No.	Sq. Root.	No.	Sq. Root.
25	5.	650	25.46	1400	37.42	2600	50.99
50	7.071	700	26.46	1450	38.08	2700	51.96
75	8.66	750	27.39	1500	38.73	2800	52.91
100	10.00	800	28.28	1550	39.37	2900	53.85
125	11.18	850	29.15	1600	40.00	3000	54.77
150	12.25	900	30.00	1650	40.62	3200	56.57
175	13.23	950	30.82	1700	41.23	3400	58.30
200	14.14	1000	31.62	1800	42.43	3600	60.00
250	15.81	1050	32.40	1900	43.59	3800	61.64
300	17.32	1100	33.16	2000	44.72	4000	63.24
350	18.70	1150	33.91	2100	45.82	4200	64.80
400	20.00	1200	34.64	2200	46.90	4400	66.32
450	21.21	1250	35.36	2300	47.95	4600	67.82
500	22.36	1300	36.06	2400	48.99	4800	69.28
550	23.45	1350	36.74	2500	50.00	5000	70.72
600	24.49						



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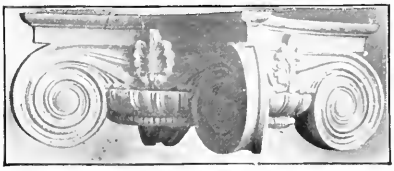

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INDEX TO BUILDING ORDINANCE.

(See pages 71 to 105.)

See page 105 for Amendments to the Building Ordinance and those ordinances that come under the supervision of the Building Department

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Norton, F. J., S N. State St.
Western Valve Co., 43 W. Randolph St.
Wilks, S. Mfg. Co., 53-55 S. Clinton St.
Wireton Heating Company, 40 Dearborn St.

BRASS CASTINGS.
Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.

BRASS AND IRON—ARCHITECTURAL.
Baldwin Brass Works, 232 and 234 S. Clinton St.
Haist, C. A. & Co., 73 W. Washington St.
Landon & Eggers, 103 S. Canal St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Company, The, N. W. Cor. 15th and Ladlin Sts.
Voss, Frederick, 617-621 Austin Av.
Winslow Bros. Co., The, 368-408 Carroll Av.

BRICK—COMMON.
Illinois Brick Co., 912-917 Chamber of Commerce Bldg.
Labahn Brick Co., 92 La Salle St.
Moulding, Thomas Co., 1007 Chamber of Commerce Bldg.

BRICK—ENAMELED.
Chicago Hydraulic Press Brick Co., third floor Chamber of Commerce Bldg.
Kimbell, S. S. & Co., 304 Chamber of Commerce.

BRICK—FIRE.
Moulding, Thomas Co., 1007 Chamber of Commerce Bldg.
Williams, N. A. Co., 219 Washington St.

BRICK—PAVING.
Moulding, Thomas Co., 1007 Chamber of Commerce Bldg.

BRICK—PRESSED.
Chicago Hydraulic Press Brick Co., third floor Chamber of Commerce Bldg.
Kimbell, S. S. & Co., 304 Chamber of Commerce.
Moulding, Thomas Co., 1007 Chamber of Commerce Bldg.

BRICK—SAND MOLD.
Chicago Hydraulic Press Brick Co., third floor Chamber of Commerce Bldg.
Kimbell, S. S. & Co., 304 Chamber of Commerce.

BRIDGES AND ROOFS.
American Bridge Company, 1315 Monadnock Blk.

BRONZE WORK—DECORATIVE AND MEMORIAL.
Winslow Bros. Company, The, 368-408 Carroll Av.

BUILDING MATERIAL.
Hines, Edward Lumber Co., Blue Island Av. and Lincoln St.
Garden City Sand Co., 1201, 188 Madison St.
Johnson, E. V. Co., 84-86 Hartford Bldg.
Knickerbocker Ice Co., 716, 171 La Salle St.
Northwestern Terra Cotta Co., The, 1118 The Rookery.

BUILDING PAPER.
Bird, F. W. & Son, 1434 Monadnock Blk.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.

BUILDERS' HARDWARE.
Chicago Hardware Mfg. Co., 308 Ashland Blk.
Clark, J. H., 155 Lake St.
Columbian Hardware Co., 27 Lake St.
Hodge & Homer Co., 47 W. Randolph St.
Orr & Lockett Hardware Co., 71-73 Randolph St.
Reading Hardware Co., 105 Lake St.
Stebbins, S. J. Co., 74 Van Buren St.
Stowell Mfg. & Fdry. Co., 86 Lake St.

CARPENTER CONTRACTORS.
Angus & Gindele Co., 1401 Security Bldg.
Ayers & Co., F. G., rooms 727-8, 218 La Salle St.
Campbell Building Co., The, 145 La Salle St.
Carpenter, Geo. H. & Co., 821 Greenleaf Av., Rogers Park.
Carsley Mfg. Co., 2242-2246 La Salle St.
Clark, C. Everett Co., 1015 Title & Trust Bldg.
Clark, W. T. & W. L., 1214 Chamber of Commerce.
Crear, William, 30 W. Randolph St.
Dameier's, C. W. Sons, 218 La Salle St., room 829.
Davis-Larkin Co., The, 710, 115 Dearborn St.
Davis, The Reginald J. Co., S. W. Cor. 23d and La Salle.
Degerman & Peterson, 134 Monroe St., room 1003.
Delfosse & Olsen, 95 Washington St.
Freeman, Hart & Co., Builders & Traders Exchange, Chamber of Commerce Bldg.
Garthwait, F. M., 318 Chamber of Commerce.
Gindele, Charles W. Co., 3333 La Salle St.
Grace & Hyde Co., 1408 Wabash Av.
Griffith, John & Son, 1009-1011 Merchants Loan & Trust Bldg.
Haigh, Joseph, 415 New York Life Bldg.
Hennessy Bros. & Evans, 605 and 606, 100 Washington St.
Leach, L. L. & Son, 1402 Marquette Bldg.
Ledgerwood, A. J. C., 916 The Temple.
Mayor, William Co., 167 Dearborn St.
McCall, T. A. & Co., 1003 Ft. Dearborn Bldg.
McCarty Brothers, 804, 134 Monroe St.
Mortimer, W. H. & C. J., 1109, 184 La Salle St.
Munro, Robert, room 480, 113 Adams St.
Mueller, Paul F. P., 823 Schiller Bldg.
Nelson, F. P. & Son, 615-16 Chamber of Commerce.
Phimister, D. G., 1027 Chicago Opera House Blk.
Scharmer, Jacob, 407 Chamber of Commerce.
Schlueter, Henry W., 1351 Marquette Bldg.
Sollitt, Ralph & Sumner Co., 140 Dearborn St.
Strandberg, E. P. & Bros., 1211 Manhattan Bldg.
Warren, William H. Mfg. Co., Blackhawk St. and Smith Av.
Wells, W. A. & A. E., 1014 Monadnock Bldg.
Wolfinger, Clarence L., 164 Lasalle St.

CARVING.
Dux, Joseph, 278 Madison St.

CARD INDEXES.
Art Metal Construction Co., 1113-1119 Merchants Loan & Trust Bldg.

CEILINGS—COPPER PLATED.
Friedley & Voshardt, 194 to 202 Mather St.

CEILINGS—ORNAMENTAL STEEL.
Encaustique Metal Interior Co., 113 Adams St.
Knisely & Yeldham Co., 273-275 Canal St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
Perkins, J. L. & Co., 241 Lake St.
Sykes Steel Roofing Co., 611 S. Morgan St.

CEILINGS—SUSPENDED, GROINED AND ARCHED.
Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.

Roebling Construction Co., The, 171-173 Lake St.

CEMENT.

Chicago Portland Cement Co., 513 Stock Exchange Bldg.
Empire Portland Cement Co., 737 Monadnock Blk.
Garden City Sand Co., The, 1201, 188 Madison St.
Meacham & Wright, 308 and 309 Chamber of Commerce Bldg.
Williams, N. A. Co., 219 Washington St.

CEMENT—AMERICAN AND IMPORTED.

Meacham & Wright, 308 and 309 Chamber of Commerce Bldg.

CEMENT COATING.

Chicago Cement Coating Co., 1641 Monadnock Blk.

CEMENT—COMMON.

Chicago Union Lime Works Co., 19th and Lincoln Sts.

CEMENT—MANUFACTURERS.

Chicago Portland Cement Co., 513 Stock Exchange Bldg.

CEMENT—HYDRAULIC.

Moulding, Thomas Co., 1007 Chamber of Commerce Bldg.

CEMENT PAVING AND FLOORS.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
Hurlbut Portland Cement Paving Co., 507 Chamber of Commerce Bldg.
Karstens & Robrahn, 760, 125 La Salle St.
Lake City Construction Co., 322 Ashland Blk.

CEMENT—PORTLAND.

Chicago Portland Cement Co., 513 Stock Exchange Bldg.
Chicago Union Lime Works Co., 19th and Lincoln Sts.
Empire Portland Cement Co., 737 Monadnock Blk.
Garden City Sand Co., The, 1201, 188 Madison St.
Meacham & Wright, 308 and 309 Chamber of Commerce Bldg.
Williams, N. A. Co., 219 Washington St.

CEMENT—UTICA HYDRAULIC.

Meacham & Wright, 308 and 309 Chamber of Commerce Bldg.
Williams, N. A. Co., 219 Washington St.

CEMENT AND CONCRETE CONSTRUCTION.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
Hurlbut Portland Cement Paving Co., 507 Chamber of Commerce Bldg.
Karstens & Robrahn, 760, 125 La Salle St.
Lake City Construction Co., 322 Ashland Blk.
Simpson Company, Chamber of Commerce Bldg.

CEMENT SIDEWALKS, PAVING AND FLOORS.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
Gilbert, Harry S., 232 Lunt Av., Rogers Park.
Hurlbut Portland Cement Paving Co., 507 Chamber of Commerce Bldg.
Karstens & Robrahn, 760, 125 La Salle St.
Lake City Construction Co., 322 Ashland Blk.
Maynard, E. W., 439 64th St.
Powell, M. W. Co., 204 Dearborn.
Simpson Company, Chamber of Commerce Bldg.
Wheeler, W. W. Co., 154 W. Washington St.

CHEMISTS.

Hunt, Robert W. & Co., 1121 The Rookery.

CHIMNEY TOPS.

Northwestern Terra Cotta Co., The, 1118 The Rookery.
Williams, N. A. Co., 219 Washington St.

CLOTHES DRYERS.

Chicago Clothes Dryer Works, 65 S. Canal St.
Nelson & Kreuter, 955-973 N. Spaulding Av.
Troy Laundry Machinery Co., 401 Fifth Av.

COMPOSITION FOR EXTERIOR AND INTERIOR—ORNAMENTAL.

Decorators Supply Co., The, 215 S. Clinton St.
Weary & Beck, 1449 Marquette Bldg.

CONCRETE CONSTRUCTION.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
Hurlbut Portland Cement Paving Co., 507 Chamber of Commerce Bldg.
Johnson, E. V., Co., 84-86 Hartford Bldg.
McNulty Bros., 624 N. Y. Life Bldg.
Roebling Construction Co., The, 171-173 Lake St.

CONCRETE FIREPROOFING.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
Johnson, E. V. Co., 84-86 Hartford Bldg.
McIlroy's Cornice Works, 1519 State St.
Roebling Construction Co., The, 171-173 Lake St.

CONDUCTOR PIPE—ORNAMENTAL.

McIlroy's Cornice Works, 1519 State St.
Perkins, J. L. & Co., 241 Lake St.

CONSOLES.

Interior Woodworking Co., 296 Wabash Av.
Rees, George H., 91 Dearborn St.

CONTRACTING ENGINEERS.

American Engineering Specialty Co., 1510 Monadnock Blk.
Davis Construction Co., 75 Michigan St.
Kohler Brothers, 1804-1812 Fisher Bldg.
Morava Construction Co., 1243 Marquette Bldg.

CONTRACTORS AND BUILDERS.

Angus & Gindele Co., 1401 Security Bldg.
Avers, F. G. & Co., rooms 727-8, 218 La Salle St.
Campbell Building Co., The, 145 La Salle St.
Carpenter, Geo. H. & Co., 821 Greenleaf Av., Rogers Park.
Carsley Mfg. Co., 2242-2256 La Salle St.
Clark, C. Everett Co., 1015 Title & Trust Bldg.
Clark, W. T. & W. L., 1214 Chamber of Commerce.
Crear, William, 30 W. Randolph St.
Dameier's, C. W. Sons, 218 La Salle St., room 829.
Davis-Larkin Co., The, 710, 115 Dearborn St.
Davis, The Reginald J. Co., S. W. Cor. 23d and La Salle.
Degerman & Peterson, 134 Monroe St., room 1003.
Delfosse & Olsen, 95 Washington St.
Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
Freeman, Hart & Co., Builders & Traders Exchange, Chamber of Commerce.
Garthwait, F. M., 318 Chamber of Commerce.
Gindele, Charles W. Co., 3332 La Salle St.
Grace & Hyde Co., 1408 Wabash Av.
Griffith, John & Son, 1009-1011 Merchants Loan & Trust Bldg.
Haigh, Joseph, 415 New York Life Bldg.
Hennessy Bros. & Evans, 605 and 606, 100 Washington St.
Lake City Construction Co., 322 Ashland Blk.
Lanquist, A., 615-616 Chamber of Commerce.
Leach, L. L. & Son, 1402 Marquette Bldg.
Leafgreen Brothers, 614 Chamber of Commerce.
Ledgerwood, A. J. C., 916 The Temple.
Lotz, Philip, 610, 58 Wabash Av.
Mayor, William Co., 167 Dearborn St.
Meagher, Arthur, Room 62, 164 La Salle St.
McCall, T. A. & Co., 1003 Ft. Dearborn Bldg.
McCarty Brothers, 804, 134 Monroe St.
Morava Construction Co., 1243 Marquette Bldg.
Mortimer, W. H. & C. J., 1109, 184 La Salle St.
Munro, Robert, room 480, 113 Adams St.
Mueller, Paul F. P., 823 Schiller Bldg.
Nelson, F. P. & Son, 615-16 Chamber of Commerce.
Nelson & Peterson, 84 La Salle St.
Phimister, D. G., 1027 Chicago Opera House Blk.
Sollitt, Ralph & Sumner Co., 140 Dearborn St.
Rodatz, Jacob, 414 The Rookery.
Scharmer, Jacob, 407 Chamber of Commerce.
Schlueter, Henry W., 1351 Marquette Bldg.
Sproul, Elliott W., 407 Chamber of Commerce.
Strandberg, E. P. & Bros., 1211 Manhattan Bldg.
Swift, Geo. B. Company, 902-904 Security Bldg.
Warren, William H. Mfg. Co., Blackhawk St. and Smith Av.
Wells, W. A. & A. E., 1014 Monadnock Bldg.
Williams, George & Co., room 11, 92 La Salle St.
Wolfinger, Clarence L., 164 La Salle St.

CORNICES—COPPER, GALVANIZED
Griffith Cornice Works, 1716 Wabash Av.
Knisely & Yeldham Co., 273-275 Canal St.
Miller, James A. & Bro., 129 S. Clinton St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
McIlroy's Cornice Works, 1519 State St.
Sykes Steel Roofing Co., 611 S. Morgan St.

CORNICE MAKERS' ORNAMENTS.
Friedley & Voshardt, 194 to 202 Mather St.

CORNICE WORK.
Knisely & Yeldham Co., 273-275 Canal St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
McIlroy's Cornice Works, 1519 State St.
Sykes Steel Roofing Co., 611 S. Morgan St.

COPING.
Northwestern Terra Cotta Co., The, 1118 The Rookery.

COPPER ORNAMENTS.
Friedley & Voshart, 194 to 202 Mather St.

CORRUGATED IRON.
Knisely & Yeldham Co., 273-275 Canal St.
Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
Miller, James A. & Bro., 129 S. Clinton St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
McIlroy's Cornice Works, 1519 State St.
Schreiber, E. A., 156 W. Ohio St.
Sykes Steel Roofing Co., 611 S. Morgan St.

COTTON TWINES.
Samson Cordage Works, 115 Congress St., Boston, Mass.

CRUSHED STONE.
Chicago Union Lime Works Co., 19th and Lincoln Sts.

CUT STONE.
Buscher & Gast, 3333 N. Clark St.

CUTLERY AND TOOLS.
Clark, J. H., 155 Lake St.
Hodge & Homer Co., 47 West Randolph St.
Orr & Lockett Hardware Co., 71-73 Randolph St.
Stebbins, S. J. Co., 74 Van Buren St.

CRAGIN GARBAGE CREMATORY AND WATER HEATERS.
Cragin Garbage Crematory Co., 285 43d St.

DAMP COURSES.
Bird, F. W. & Son, 1434 Monadnock Blk.
Simpson Company, Chamber of Commerce Bldg.
Watson, H. F. Co., 80 E. Taylor St.

DAMP PROOFING.
Bird, F. W. & Son, 1434 Monadnock Blk.

DEADENING CINDERS.
Central Wrecking Co., 87 Washington St.

DEADENING FELT—QUILT.
Bird, F. W. & Son, 1434 Monadnock Blk.
Salt Mountain Asbestos Mfg. Co., 123-127 Ontario St.
Watson, H. F. Co., 80 E. Taylor St.

DEADENING FELT.
Manville Covering Co., 173 Randolph St.

DECORATORS.
Allen, Frank, 4828 N. Clark St., Rogers Park.
Builders Painting & Decorating Co., 185 Dearborn, room 603.
Crossman & Sturdy, 287 Michigan Av.
Maxwell, J. F., 4771 N. Clark St.
McCarthy, J. G. Company, 1832 Wabash Av.
Mitchel & Halbach, 264 Michigan Av.
Spierling & Linden, 1216 Michigan Av.

DOOR HANGERS—PARLOR.
Stowell Mfg. & Fdry. Co., 86 Lake St.

DOORS.
Chicago Veneered Door Co., 216 Chamber of Commerce.
Coallier, A. E., 31st and Loomis Sts.
Compound Door Co., 189 La Salle St., room 82.
True & True Co., Blue Island Av. and Lincoln St.

DOORS—VENEERED.
Chicago Veneered Door Co., 216 Chamber of Commerce.
Compound Door Co., 189 La Salle St.

DRAINAGE.
Art Plumbing Co., room 2, Reaper Blk.
Byrne & Ryan, 4308 Cottage Grove Av.
Thorogood, Robert F., 713 Greenleaf Av.

DRAIN TILE.
Williams, N. A. Co., 219 Washington St.

DRAPERIES.
Mitchel & Halbach, 264 Michigan Av.

DRAWING MATERIALS.
Keuffel & Esser Co., of N. Y., 111 Madison St.

DRY ROOMS.
Troy Laundry Machinery Co., 401 Fifth Av.

DRY ROOMS—STEAM.
Chicago Clothes Dryer Works, 65 S. Canal St.
Kehm Bros. & Mertz, 19 N. State St.

DUMB WAITERS.
Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.

DYNAMOS.
Chicago Edison Co., 139 Adams St.
Frantzen, Arthur Company, 225 Dearborn St.
Kohler Brothers, 1804-1812 Fisher Bldg.
Petersen & De Hosson Mfg. Co.
Wagner Electric Manufacturing Co., 1624 Marquette Bldg.
Western Electric Company, 259 S. Clinton St.

ELECTRICAL APPARATUS AND SUPPLIES.
Alberene Stone Co., 115 S. Clinton St.
Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.
Chicago Edison Co., 139 Adams St.
Crockett, W. P., 315 Dearborn St.
Kohler Brothers, 1804-1812 Fisher Bldg.
McFell Electric & Telephone Co., 1627 Marquette Bldg.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Wagner Electric Manufacturing Co., 1624 Marquette Bldg.
Western Electric Company, 259 S. Clinton St.
Winslow Bros. Company, The, 368-408 Carroll Av.

ELECTRICAL CONSTRUCTION.
Chicago Edison Co., 139 Adams St.
Frantzen, Arthur Company, 225 Dearborn.
House, C. L., 52 State St.
Kohler Brothers, 1804-1812 Fisher Bldg.
McFell Electric & Telephone Co., 1627 Marquette Bldg.
Munro, Robert, room 480, 113 Adams St.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Wagner Electric Manufacturing Co., 1624 Marquette Bldg.
Western Electric Company, 259 S. Clinton St.

ELECTRICAL FUSES.
Manville Covering Co., 173 Randolph St.

ELECTRIC BELLS AND LIGHTING.
Chicago Edison Co., 139 Adams St.
Frantzen, Arthur Company, 225 Dearborn St.
House, C. L., 52 State St.
McFell Electric & Telephone Co., 1627 Marquette Bldg.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Wagner Electric Manufacturing Co., 1624 Marquette Bldg.
Western Electric Company, 259 S. Clinton St.

ELECTRIC ELEVATORS.
Burdett-Rowntree Mfg. Co., 8587 W. Jackson Blvd.
Eaton & Prince Co., 70-76 Michigan St.
Otis Elevator Co., 409 Fisher Bldg.
Winslow Bros. Company, The, 368-408 Carroll Av.

ELECTRIC FIXTURES.
Chicago Edison Co., 139 Adams St.
House, C. L., 52 State St.
McFell Electric & Telephone Co., 1627 Marquette Bldg.
Wagner Electric Manufacturing Co., 1624 Marquette Bldg.
Western Electric Company, 259 S. Clinton St.
Wingrave & MacNaughten Co., 180 Wabash Av.

ELECTRIC MOTORS.
Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.
Chicago Edison Co., 139 Adams St.
Frantzen, Arthur Company, 225 Dearborn St.
House, C. L., 52 State St.
Kohler Brothers, 1804-1812 Fisher Bldg.
McFell Electric & Telephone Co., 1627 Marquette Bldg.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.

Wagner Electric Manufacturing Co., 1624 Marquette Bldg.
Western Electric Company, 259 S. Clinton St.

ELECTRIC SWITCHES.

Crockett, W. P., 315 Dearborn St.
Frantzen, Arthur, Company, 225 Dearborn St.

ELEVATOR CARS.

Standard Company, The, N. W. Cor. 15th and Laflin Sts.

ELEVATOR DOORS AND ENCLOSURES—BRASS, IRON AND WIRE.

Booth, John, 114 and 116 E. Lake St.
Braumoeller, Henry & Son, 90 W. Van Buren St.
Halsted, Joseph, 388 W. Randolph St.
Haist, C. A. & Co., 73 W. Washington St.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.
Winslow Bros. Company, The, 368-408 Carroll Av.

ELEVATOR DOOR DEVICES.

Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.

ELEVATOR ELECTRIC SIGNALS.

Elevator Supply & Repair Co., 36 W. Monroe St.

ELEVATOR FIRE DOORS.

Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.
Kinnear Mfg. Co., The, 911, 112 Clark St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.

ELEVATOR FLOOR INDICATORS.

Elevator Supply & Repair Co., 36 W. Monroe St.

ELEVATOR MACHINERY.

Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.
Eaton & Prince Co., 70-76 Michigan St.
Winslow Bros. Company, The, 368-408 Carroll Av.

ELEVATOR REPAIRS.

Elevator Supply & Repair Co., 36 W. Monroe St.
Otis Elevator Co., 409 Fisher Bldg.

ELEVATORS.

Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.
Eaton & Prince Co., 70-76 Michigan St.
Elevator Supply & Repair Co., 36 W. Monroe St.
Winslow Bros. Company, The, 368-408 Carroll Av.

ELEVATORS—PASSENGER AND FREIGHT.

Otis Elevator Co., 409 Fisher Bldg.

ELEVATORS—FREIGHT.

Eaton & Prince Co., 70-76 Michigan St.
Otis Elevator Co., 409 Fisher Bldg.
Winslow Bros. Company, The, 368-408 Carroll Av.

ENAMELED STEEL CEILINGS.

Encaustique Metal Interior Co., 113 Adams St.

ENGINEERS.

American Bridge Company, 1315 Monadnock Blk.
American Engineering Specialty Company, 1510 Monadnock Blk.
Davis Construction Co., 75 Michigan St.
Hunt, Robert W. & Co., 1121 The Rookery.

EXCAVATING, FILLING AND GRADING.

Central Wrecking Co., 87 Washington St.

EXPANDED METAL LATH.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.

EXPANSION TANKS.

International Heater Co., 48 Dearborn St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kroeschell Bros. Co., 55 Erie St.

EXPERT ACCOUNTANTS.

Audit Company, of Chicago, The, 218 La Salle St.

FIRE BRICK AND CLAY.

Dexter Mfg. & Supply Co., 269 Dearborn St.
Mackolite Fireproofing Co., 1401 Schiller Bldg.
Williams, N. A. Co., 219 Washington St.

FILTERS.

Jewell, I. H., 810 Marquette Bldg.

FIRE ESCAPES.

Booth, John, 114 and 116 E. Lake St.
Braumoeller, Henry & Son, 90 W. Van Buren St.
Halsted, Joseph, 388 W. Randolph St.
Hammill Fire Escape Co., 1008, 112 Clark St.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Muth, Chr., 428 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.

FIRE PROOFING.

International Metal Lath Co., Niles, O.
Johnson, E. V. Co., 84-86 Hartford Bldg.
Mackolite Fireproofing Co., 1401 Schiller Bldg.
Manville Covering Co., 173 Randolph St.
Roebling Construction Co., The, 171-173 Lake St.

FIRE PROOFING—CONCRETE.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
Johnson, E. V. Co., 84-86 Hartford Bldg.
Roebling Construction Co., The, 171-173 Lake St.
Simpson Company, Chamber of Commerce Bldg.

FIREPROOF PAINTS.

Manville Covering Co., 173 Randolph St.

FIREPROOF PAINTS—ANTI FLAME.

Chicago Fire Proof Covering Co., 18-20 N. Canal St.
Lucas, John & Co., 55 N. Jefferson St.
Salt Mountain Asbestos Mfg. Co., 123-127 Ontario St.

FIRE PROOF PAINTS—ASBESTRINE.

Speare's, The Alden Sons Co., 9 Milwaukee Av.

FIREPROOF PAPER.

Bird, F. W. & Son, 1434 Monadnock Blk.

FIREPROOF PARTITIONS.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
International Metal Lath Co., Niles, O.
Johnson, E. V. Co., 84-86 Hartford Bldg.
Mackolite Fireproofing Co., 1401 Schiller Bldg.
Roebling Construction Co., The, 171-173 Lake St.
Voss, Frederick, 617-621 Austin Av.

FIREPROOF SASH AND FRAMES.

Knisely & Yeldham Co., 273-275 Canal St.
Voigtman & Company, 123-127 Ontario St.

FIREPROOF SHUTTERS.

Kinnear Mfg. Co., The, 911, 112 Clark St.
Rolling Steel Shutter Works, 162-164 W. 27th St., New York City.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.

FIREPROOF SHUTTERS AND DOORS—STEEL ROLLING.

Braumoeller, Henry & Son, 90 W. Van Buren.
Kinnear Mfg. Co., The, 911, 112 Clark St.
Rolling Steel Shutter Works, 162-164 West 27th St., New York City.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.

FIREPROOF WINDOWS.

Braumoeller, Henry & Son, 90 W. Van Buren St.
Knisely & Yeldham Co., 273-275 Canal St.
McIlroy Cornice Works, 1519, 51 State St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Voigtman & Company, 123-127 Ontario St.

FIREPROOF WIRE LATH.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
International Metal Lath Co., Niles, O.
Roebling Construction Co., The, 171-173 Lake St.

Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.

FIRE WINDOWS.

Knisely & Yeldham Co., 273-275 Canal St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
Miller, James A. & Bro., 129 S. Clinton St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Voigtman & Company, 123-127 Ontario St.

FLOORS.

Chicago Floor Co., 159 Wabash Av.

FLOOR AND ROOF LIGHTS.

Brown Bros. Mfg. Co., Jackson Blvd. N. W. Cor. Clinton.
Chicago Floor Co., 159 Wabash Av.

FLOORING—HARDWOOD.

Chicago Floor Co., 159 Wabash Av.
Rittenhouse & Embree Co., 3500 Center Av.
Wilce, T. Co., 22d and Throop St.

FLOORING—HARDWOOD, KILN DRIED.

Chicago Floor Co., 159 Wabash Av.
Rittenhouse & Embree Co., 3500 Center Av.
Spry, John Lumber Co., Ashland Av. and 22d St.
Wilce, T. Co., 22d and Throop St.

FLOORS—PARQUETRY.

Chicago Floor Co., 159 Wabash Av.

FLOOR WAX.

Chicago Floor Co., 159 Wabash Av.
Lucas John & Co., 55 N. Jefferson St.

FLUE LININGS.

Garden City Sand Co., The, 1201, 188 Madison St.
Chicago Hydraulic Press Brick Co., third floor Chamber of Commerce Bldg.
Williams, N. A. Co., 219 Washington St.

FORGINGS.

American Bridge Company, 1315 Monadnock Blk.

FRESCO PAINTERS.

Mitchel & Halbach, 264 Michigan Av.

FURNACES.

American Warming & Ventilating Co., 433 Wabash Av.
Dexter Mfg. & Supply Co., 269 Dearborn St.
Hawley Down Draft Furnace Co., Superior and Townsend Sts.
International Heater Co., 48 Dearborn St.
McCoy, John, 31 Dearborn St.
Story, March R., 83 N. Clark St.
Wireton Heating Company, 40 Dearborn St.

GALVANIZED IRON.

Griffith Cornice Works, 1716 Wabash Av.
Lloyd Iron Roofing & Paint Co., 99-101 W. Monroe St.
McIlroy's Cornice Works, 1519 State St.
Miller, James A. & Bro., 129 S. Clinton St.
Sykes Steel Roofing Co., 611 S. Morgan St.

GARBAGE CREMATORIES.

Cragin Garbage Crematory Co., 285 43d St.

GAS—ILLUMINATING.

Peoples Gas Light & Coke Co., The, Michigan Av. and Adams St.

GAS—NATURAL.

Peoples Gas Light & Coke Co., The, Michigan Av. and Adams St.

GASFITTING.

Brown & Mortimer, 45 W. Washington St.
Byrne & Ryan, 4308 Cottage Grove Av.
Daly, J. J., 87 Fifth Av.
Wills & Smith, 5938 S. Halsted St.

GAS FIXTURES.

Wingrave & MacNaughtan Co., 189 Wabash Av.

GAS MACHINES.

Johnson Temperature Controlling Co., 411 Dearborn St.

GENERAL CONTRACTORS.

Angus & Gindele Co., 1401 Security Bldg.
Avers, F. G. & Co., rooms 727-8, 218 La Salle St.
Campbell Building Co., The, 145 La Salle St.
Carpenter, Geo. H. & Co., 821 Greenleaf Av., Rogers Park.
Carsley Mfg. Co., 2242-2256 La Salle St.
Central Wrecking Co., 87 Washington St.
Clark, C. Everett Company, 1015 Title & Trust Bldg.
Clark, W. T. & W. I., 1214 Chamber of Commerce.
Crear, William, 30 W. Randolph St.
Dameier's, C. W. Sons, 218 La Salle St., room 829.
Davis-Larkin Co., The, 710, 115 Dearborn St.
Davis, The Reginald J. Co., S. W. Cor. 23d and La Salle.
Degerman & Peterson, 134 Monroe St., room 1003.
Delfosse & Olsen, 95 Washington St.
Freeman, Hart & Co., Builders & Traders Exchange, Chamber of Commerce.
Garthwait, F. M., 318 Chamber of Commerce.
Gindele, Charles W. Co., 3333 La Salle St.
Grace & Hyde Co., 1408 Wabash Av.
Griffith, John & Son, 1009-1011 Merchants Loan & Trust Bldg.
Haigh, Joseph, 415 New York Life Bldg.
Hennessy Bros. & Evans, 605 and 606, 100 Washington St.
Johnson Temperature Controlling Co., 411 Dearborn St.
Knickerbocker Improvement Co., The, 92 La Salle St.
Lake City Construction Co., 322 Ashland Blk.
Lanquist, A., 615-616 Chamber of Commerce.
Leach, L. L. & Son, 1402 Marquette Bldg.
Leafgreen Brothers, 614 Chamber of Commerce.
Ledgerwood, A. J. C., 916 The Temple.
Lotz, Philip, 610, 58 Wabash Av.
Mavor, William Co., 167 Dearborn St.
Meagher, Arthur, room 62, 164 La Salle St.
McCall, T. A. & Co., 1003 Ft. Dearborn Bldg.
McCarty Brothers, 804, 134 Monroe St.
Morava Construction Co., 1243 Marquette Bldg.
Mortimer, W. H. & C. J., 1109, 184 La Salle St.
Mueller, Paul F. P., 823 Schiller Bldg.
Nelson, F. P. & Son, 615-16 Chamber of Commerce.
Nelson & Peterson, 84 La Salle St.
Phimister, D. G., 1027 Chicago Opera House Blk.
Rodatz, Jacob, 414 The Rookery.
Scharmer, Jacob, 407 Chamber of Commerce.
Schlueter, Henry W., 1351 Marquette Bldg.
Sollitt, Ralph & Sumner Co., 140 Dearborn St.
Sproul, Elliott W., 407 Chamber of Commerce.
Strandberg, E. P. & Bros., 1211 Manhattan Bldg.
Swift, Geo B. Company, 902-904 Security Bldg.
Thomson, Geo. & Son Co., 167 Dearborn St.
Wells, W. A. & A. E., 1014 Monadnock Bldg.
Williams, George & Co., room 11, 92 La Salle St.
Wolfinger, Clarence L., 164 La Salle St.

GENERAL ROOFING.

Manville Covering Co., 173 Randolph St.
McIlroy Cornice Works, 1519, 51 State St.
Miller, James A. & Bro., 129 S. Clinton St.
Murdoch, Wm. & Co., 167 Dearborn St.
Randolph, C. W., 825-827 Clifton Av.
Rosenbaum, H., 219, 184 La Salle St.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.

GLASS.

American Luxfer Prism Co., 372 Fulton St.
Hooker, H. M. Co., 57 W. Randolph St.
Rice, James H. Co., 34 to 40 South Water St.
Tyler & Hippach, 88 Randolph St.

GLASS—ART, ORNAMENTAL AND STAINED.

American Luxfer Prism Co., 372 Fulton St.
Hooker, H. M. Co., 57 W. Randolph St.
Linden Glass Company, 1216 Michigan Av.
Rice, James H. Co., 34 to 40 South Water St.
Schuler & Mueller, Madison and Canal Sts.

GLASS—BEVELED.

American Luxfer Prism Co., 372 Fulton St.
Hooker, H. M. Co., 57 W. Randolph St.
Pittsburgh Plate Glass Co., 442 Wabash Av.
Schuler & Mueller, Madison and Canal Sts.

GLASS—CUT.

Hooker, H. M. Co., 57 W. Randolph St.
Pittsburgh Plate Glass Co., 442 Wabash Av.
Schuler & Mueller, Madison and Canal Sts.

GLASS—ORNAMENTAL.

American Luxfer Prism Co., 372 Fulton St.
Hooker, H. M. Co., 57 W. Randolph St.
Linden Glass Company, 1216 Michigan Av.
Pittsburgh Plate Glass Co., 442 Wabash Av.

Schuler & Mueller, Madison and Canal Sts.
Tyler & Hippach, 88 Randolph St.

GLASS—PLATE.

Hooker, H. M. Co., 57 W. Randolph St.
Rice, James H. Co., 34 to 40 South Water St.
Tyler & Hippach, 88 Randolph St.

GLASS—PLATE AND WINDOW.

Hooker, H. M. Co., 57 W. Randolph St.
Pittsburgh Plate Glass Co., 442 Wabash Av.

GLASS—PRISMATIC.

American Luxfer Prism Co., 372 Fulton St.
Schreiber, E. A., 156 E. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.

GLASS—STAINED.

American Luxfer Prism Co., 372 Fulton St.
Hooker, H. M. Co., 57 W. Randolph St.
Schuler & Mueller, Madison and Canal Sts.

GRATES.

Interior Woodworking Co., 296 Wabash Av.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Rees, George H., 91 Dearborn St.
McCoy, John, 31 Dearborn St.

GRATES—BOILER.

Kellogg-Mackay-Cameron Co., 110 Lake St.

GRAVEL ROOFING.

Griffith Cornice Works, 1716 Wabash Av.
Manville Covering Co., 173 Randolph St.
Murdoch, Wm. & Co., 167 Dearborn St.
Sykes Steel Roofing Co., 611 S. Morgan St.

GRILLE WORK.

Bertelsen Adjustable Grille Co., 306 and 308 S. Clinton St.
Chicago Floor Co., 159 Wabash Av.
Decorators Supply Co., The, 215 S. Clinton St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
True & True Co., Blue Island Av. and Lincoln St.
Voss, Frederick, 617-621 Austin Av.
Winslow Bros. Company, The, 368-408 Carroll Av.

HARDWARE.

Columbian Hardware Co., 27 Lake St.

HAIR FELT.

Kellogg-Mackay-Cameron Co., 110 Lake St.
Manville Covering Co., 173 Randolph St.

HANGERS—JOIST.

Columbian Hardware Co., 27 Lake St.

HARDWARE—BUILDERS'.

Chicago Hardware Mfg. C., 308 Ashland Blk.
Clark, J. H., 155 Lake St.
Hodge & Homer Co., 47 W. Randolph St.
Orr & Lockett Hardware Co., 71-73 Randolph St.
Reading Hardware Co., 105 Lake St.
Stebbins, S. J. Co., 74 Van Buren St.
Stowell Mfg. & Fdry. Co., 86 Lake St.

HARDWARE—MANUFACTURERS'.

Chicago Hardware Mfg. Co., 308 Ashland Blk.
Columbian Hardware Co., 27 Lake St.
Reading Hardware Co., 105 Lake St.

HARDWARE SPECIALTIES.

Chicago Hardware Mfg. Co., 308 Ashland Blk.
Columbian Hardware Co., 27 Lake St.
Reading Hardware Co., 105 Lake St.
Stowell Mfg. & Fdry. Co., 86 Lake St.

HARDWOOD FINISHERS.

Builders Painting & Decorating Co., 185 Dearborn St., room 603.

HARDWOOD FLOORING.

Chicago Floor Co., 159 Wabash Av.
Rittenhouse & Embree Co., 3500 Center Av.
Spry, John Lumber Co., Ashland Av. and 22d St.
Wilce, T. Co., 22d and Throop St.

HARDWOOD LUMBER.

Rittenhouse & Embree Co., 3500 Center Av.
Wilce, T. Co., 22d and Throop St.

HEATING.

American Radiator Co., 99 Lake St., Cor. Dearborn.
Graves Bros. & Co., 156 Lake St.
Graves, W. B., 116 Lake St.
Ideal Heating Co., 414 W. 63d St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Pope, W. A., 79 Lake St.
Wireton Heating Company, 40 Dearborn St.

HEATING AND VENTILATING.

American Engineering Specialty Company, 1510 Monadnock Blk.
American Radiator Co., 99 Lake St., Cor. Dearborn.
American Warming & Ventilating Co., 433 Wabash Av.
Baker & Smith, 93 and 95 Fifth Av.
Davis Construction Co., 75 Michigan St.
Douglas, T. J., 40 Dearborn, room 416.
Graves Bros. & Co., 156 Lake St.
Graves, W. B., 116 Lake St.
Ideal Heating Co., 414 W. 63d St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kroeschell Bros. Co., 55 Erie St.
McCoy, John, 31 Dearborn St.
Norton, F. J., 8 N. State St.
Phillips-Getschow Co., 98 La Salle Av.
Pope, W. A., 79 Lake St.
Schampel, G. F., 155 Washington St.
Story, March R., 83 N. Clark St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Thomas & Smith, 16 N. Canal St.

HEATING APPARATUS.

American Engineering Specialty Company, 1510 Monadnock Blk.
American Radiator Co., 99 Lake St., Cor. Dearborn.
American Warming & Ventilating Co., 433 Wabash Av.
Arcade Steam Heating Co., 70 La Salle St.
Baker & Smith, 93 and 95 Fifth Av.
Davis Construction Co., 75 Michigan St.
Dilzer, Fred, 48 Dearborn St.
Douglas, T. J., 40 Dearborn, room 416.
Graves Bros. & Co., 156 Lake St.
Graves, W. B., 116 Lake St.
Herbert, M. E. Heater Co., 240-242 Root St.
Ideal Heating Co., 414 W. 63d St.
International Heater Co., 48 Dearborn St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kewanee Boiler Co., 167-169 Lake St.
Kroeschell Bros. Co., 55 Erie St.
McCoy, John, 31 Dearborn St.
Model Heating Co., 50-52 S. Canal St.
Norton, F. J., 8 N. State St.
Phillips-Getschow Co., 98 La Salle Av.
Pope, W. A., 79 Lake St.
Schampel, G. F., 155 Washington St.
Thomas & Smith, 16 N. Canal St.
Wilks, S. Mfg. Co., 53-55 S. Clinton St.
Wireton Heating Company, 40 Dearborn St.

HEATERS—COMBINATION.

International Heater Co., 48 Dearborn St.

HEATING SUPPLIES.

American Radiator Co., 99 Lake St., Cor. Dearborn.
American Warming & Ventilating Co., 433 Wabash Av.
Baker & Smith Co., 93-95 Fifth Av.
Davis, G. M. Regulator Co., 120 N. Clinton St.
Douglas, T. J., 40 Dearborn, room 416.
International Heater Co., 48 Dearborn St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kewanee Boiler Co., 167-169 Lake St.
Kroeschell Bros. Co., 55 Erie St.
McCoy, John, 31 Dearborn St.
Norton, F. J., 8 N. State St.
Wilks, S. Mfg. Co., 53-55 S. Clinton St.

HEAT REGULATION.

Johnson Temperature Controlling Co., 411 Dearborn St.
Kehm Bros. & Mertz, 19 N. State St.
McCoy, John, 31 Dearborn St.
Norton, F. J., 8 N. State St.

HOT AIR ENGINES.

Fanning Mfg. Co., Morgan, Pratt and Superior Sts.
Rider-Ericsson Eng. Co., 40 Dearborn St.
Thomas & Smith, 16 N. Canal St.

HOT BLAST HEATING APPARATUS.

American Engineering Specialty Company, 1510 Monadnock Blk.
American Radiator Co., 99 Lake St., Cor. Dearborn.
Davis Construction Co., 75 Michigan St.
Davis, G. M. Regulator Co., 120 N. Clinton St.
Kehm Bros. & Mertz, 19 N. State St.
Pope, W. A., 79 Lake St.

HOT WATER AND STEAM HEATING.

American Engineering Specialty Company, 1510 Monadnock Blk.

American Radiator Co., 99 Lake St., Cor. Dearborn.
American Warming & Ventilating Co., 433 Wabash Av.
Arcade Steam Heating Co., 70 La Salle St.
Baker & Smith, 93 and 95 Fifth Av.
Davis Construction Co., 75 Michigan St.
Dilzer, Fred, 48 Dearborn St.
Douglas, T. J., 40 Dearborn St., room 416.
Graves Bros. & Co., 156 Lake St.
Graves, W. B., 116 Lake St.
Herbert, M. E. Heater Co., 240-242 Root St.
Ideal Heating Co., 414 W. 63d St.
Kehm Bros. & Mertz, 19 N. State St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kroeschell Bros. Co., 55 Erie St.
McCoy, John, 31 Dearborn St.
Norton, F. J., 8 N. State St.
Phillips, Getschow Co., 98 La Salle Av.
Pope, W. A., 79 Lake St.
Schampel, G. F., 155 Washington St.
Wills & Smith, 598 S. Halsted St.

HOT WATER HEATERS.

American Engineering Specialty Company, 1510 Monadnock Blk.
American Radiator Co., 99 Lake St., Cor. Dearborn.
American Warming & Ventilating Co., 433 Wabash Av.
Baker & Smith Co., 93-95 Fifth Av.
Cragin Garbage Crematory Co., 285 43d St.
Davis Construction Co., 75 Michigan St.
Douglas, T. J., 40 Dearborn, room 416.
Duffy, E. S. Mfg. Co., 6438 Wentworth Av.
Herbert, M. E. Heater Co., 240-242 Root St.
International Heater Co., 48 Dearborn St.
Kehm Bros. & Mertz, 19 N. State St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kewanee Boiler Co., 167-169 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Model Heating Co., 50-52 S. Canal St.
Norton, F. J., 8 N. State St.
Thomas & Smith, 16 N. Canal St.
Western Valve Co., 43 W. Randolph St.
Wilks, S. Mfg. Co., 53-55 S. Clinton St.
Wireton Heating Company, 40 Dearborn St.
Wills & Smith, 598 S. Halsted St.

HOUSE MOVERS AND RAISERS.

Sheeler, H., 716 Chamber of Commerce Bldg.
Sunderman, John, 7214 Lowe Av.

HOUSE WRECKERS.

Central Wrecking Co., 87 Washington St.

HYDRAULIC ELEVATORS.

Eaton & Prince Co., 70-76 Michigan St.
Otis Elevator Co., 409 Fisher Bldg.
Winslow Bros. Company, The, 398-408 Carroll Av.

ICE.

Knickerbocker Ice Co., 716, 171 La Salle St.

ICE MACHINERY.

Barber, A. H. Mfg. Co., 229 S. Water St.

ICE MACHINERY AND ICE FACTORY SUPPLIES.

Wolf, The Fred W. Co., 139-143 Rees St.

ICE MAKING MACHINERY.

Barber, A. H. Mfg. Co., 229 S. Water St.
Wolf, The Fred W. Co., 139-143 Rees St.

INDICATORS—ELEVATOR.

Burdett-Rowntree Mfg. Co., 85-87 W. Jackson Blvd.
Eaton & Prince Co., 70-76 Michigan St.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.

INDUCED DRAFT REGULATORS.

Davis, G. M. Regulator Co., 120 N. Clinton St.

INSPECTORS.

Hunt, Robert W. & Co., 1121 The Rookery.

INSULATING PAPER—WATERPROOF.

Bird, F. W. & Son, 1434 Monadnock Blk.

INTERIOR DECORATORS.

Crossman & Sturdy, 287 Michigan Av.
Mitchel & Halbach, 204 Michigan Av.
Spierling & Linden, 1216 Michigan Av.

INTERIOR FINISH.

Carsley Mfg. Co., 2242-2256 La Salle St.
Compound Door Co., 189 La Salle St., room 820.
Davis, The Reginald J. Co., S. W. Cor. 23d and La Salle.
Interior Woodworking Co., 296 Wabash Av.
McCarthy, J. G. Company, 1832 Wabash Av.
True & True Co., Blue Island Av. and Lincoln St.
Warren, William H. Mfg. Co., Blackhawk St. and Smith Av.
Wolfinger, Clarence L., 164 La Salle St.

IRON AND STEEL BEAMS AND COLUMNS.

American Bridge Company, 1315 Monadnock Blk.
Brown Bros. Mfg. Co., Jackson Blvd. N. W. Cor. Clinton St.
Halsted, Joseph, 388 W. Randolph St.
Moravа Construction Co., 1243 Marquette Bldg.
Muth, Chr., 428 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.

IRON DOORS AND SHUTTERS.

Braunmoeller, Henry & Son, 90 W. Van Buren St.
Halsted, Joseph, 388 W. Randolph St.
Kinnear Mfg. Co., The, 911, 112 Clark St.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
McCoy, John, 31 Dearborn St.
Muth, Chr., 428 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Rolling Steel Shutter Works, 162-164 West 27th St., New York City.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Architectural Iron Works, The, 181 Newberry Av.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.

IRON PIPE—LEAD LINED.

Lead Lined Iron Pipe Co., Wakefield, Mass.

IRON RAILINGS AND FENCES.

Booth, John, 114 and 116 E. Lake St.
Braunmoeller, Henry & Son, 90 W. Van Buren St.
Halsted, Joseph, 388 W. Randolph St.
Haist, C. A. & Co., 73 W. Washington St.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Muth, Chr., 428 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Architectural Iron Works, The, 181 Newberry Av.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.
Winslow Bros. Company, The, 398-408 Carroll Av.

IRON ROOFS.

American Bridge Company, 1315 Monadnock Blk.
Lloyd Iron Roofing & Paint Co., 99-101 W. Monroe St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
Muth, Chr., 428 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Schreiber, E. A., 156 W. Ohio St.
Strobel, C. L., 1744 Monadnock Bldg.
Sykes Steel Roofing Co., 611 S. Morgan St.

IRON STAIRS.

Braunmoeller, Henry & Son, 90 W. Van Buren St.
Brown Bros. Mfg. Co., Jackson Blvd. N. W. Cor. Clinton St.
Halsted, Joseph, 388 W. Randolph St.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Muth, Chr., 428 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Architectural Iron Works, The, 181 Newberry Av.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.

Voss, Frederick, 617-621 Austin Av.
Winslow Bros. Company, The, 368-408 Carroll Av.

IRON STORE FRONTS.

Braumoeller, Henry & Son, 90 W. Van Buren St.
Brown Bros. Mfg. Co., Jackson Blvd. N. W. Cor. Clinton St.
Halsted, Joseph, 388 W. Randolph St.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Muth, Chr., 428 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Architectural Iron Works, The, 181 Newberry Av.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Winslow Bros. Company, The, 368-408 Carroll Av.

IRON WORK—ORNAMENTAL.

Booth, John, 114 and 116 E. Lake St.
Columbian Hardware Co., 27 Lake St.
Haist, C. A. & Co., 73 W. Washington St.
Halsted, Joseph, 388 W. Randolph St.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Muth, Chr., 428 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Architectural Iron Works, The, 181 Newberry Av.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.
Winslow Bros. Company, The, 368-408 Carroll Av.

IRON WORK—STRUCTURAL.

American Bridge Company, 1315 Monadnock Blg.
Braumoeller, Henry & Son, 90 W. Van Buren St.
Brown Bros. Mfg. Co., Jackson Blvd. N. W. Cor. Clinton St.
Clark, C. Everett Co., 1015 Title & Trust Bldg.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Morava Construction Co., 1243 Marquette Bldg.
Muth, Chr., 420 Blue Island Av.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Architectural Iron Works, The, 181 Newberry Av.
Strobel, C. L., 1744 Monadnock Bldg.

JAIL AND PRISON BUILDERS.

Halsted, Joseph, 388 W. Randolph St.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Architectural Iron Works, The, 181 Newberry Av.
Voss, Frederick, 617-621 Austin Av.

JAIL WORK.

Smith, F. P. Wire & Iron Works, 100-102 Lake St.

LAMPS—ARC AND INCANDESCENT.

Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.

LAMPS AND LAMP PILLARS.

Smith, F. P. Wire & Iron Works, 100-102 Lake St.

LATH—METAL AND WIRE.

Booth, John, 114 and 116 E. Lake St.
International Metal Lath Co., Niles, O.
Perkins, J. L. & Co., 241 Lake St.
Roebling Construction Co., The, 171-173 Lake St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Voss, Frederick, 617-621 Austin Av.

LAUNDRY DRYERS.

Chicago Clothes Dryer Works, 65 S. Canal St.
Nelson & Kreuter, 955-973 N. Spaulding Av.
Troy Laundry Machinery Co., 401 Fifth Av.

LAUNDRY MACHINERY.

Chicago Clothes Dryer Works, 65 S. Canal St.
Nelson & Kreuter, 955-973 Spaulding Av.
Troy Laundry Machinery Co., 401 Fifth Av.

LAUNDRY MACHINERY SUPPLIES.

Nelson & Kreuter, 955-973 Spalding Av.
Troy Laundry Machinery Co., 401 Fifth Av.

LAUNDRY TRAYS AND KITCHEN SINKS.

Alberene Stone Co., 115 S. Canal St.

LEAD LINED IRON PIPE.

Lead Lined Iron Pipe Co., Wakefield, Mass.

LIBRARY FURNITURE AND FIXTURES—STEEL.

Art Metal Construction Co., 1113-1119 Merchants Loan & Trust Bldg.

LIME.

Chicago Union Lime Works Co., 19th and Lincoln Sts.
Knickerbocker Ice Co., 716, 171 La Salle St.
Meacham & Wright, 308 and 309 Chamber of Commerce Bldg.
Strobel, C. L., 1744 Monadnock Bldg.

LUMBER.

Cottage Grove Mfg. Co., 91 38th St.
Green, Geo. Lumber Co., 22d and Loomis Sts.
Hines, Edward Lumber Co., Blue Island Av. and Lincoln St.
Rittenhouse & Embree Co., 3500 Center Av.
Spry, John Lumber Co., Ashland Av. and 22d St.
Wilce, T. Co., 22d and Throop St.

MACHINISTS.

Wolf, The Fred W. Co., 139-143 Rees St.

MALT KILN FLOORS.

Wolf, The Fred W. Co., 139-143 Rees St.

MANTELS.

Carsley Mfg. Co., 2242-2256 La Salle St.
Davis, The Reginald J. Co., S. W. Cor. 23d and La Salle Sts.
Interior Woodworking Co., 206 Wabash Av.
Rees, George H., 91 Dearborn St.

MARBLE WORKERS AND DEALERS.

Buscher & Gast, 3333 N. Clark St.
Caretti, John & Co., 234 Michigan St.
Henry, Frank, 1628 Wabash Av.
Sherman & Flavin, 2511 State St.

MASON CONTRACTORS.

Angus & Gindele, 1401 Security Bldg.
Campbell Building Co., The, 145 La Salle St.
Clark, C. Everett Co., 1015 Title & Trust.
Clark, W. T. & W. L., 1214 Chamber of Commerce.
Crear, William, 30 W. Randolph St.
Dameer's, C. W. Sons, 820, 218 La Salle St.
Davis-Larkin Co., The, 710, 115 Dearborn St.
Degerman & Peterson, 134 Monroe St., room 1003.
Delfosse & Olson, 95 Washington St.
Freeman, Hart & Co., Builders & Traders Exchange, Chamber of Commerce.
Garthwait, F. M., 318 Chamber of Commerce.
Gilbert, Harry S., 232 Lunt Av., Rogers Park.
Gindele, Chas. W. Co., 3333 La Salle St.
Grace & Hyde Co., 1408 Wabash Av.
Griffith, John & Son, 1009-1011 Merchants Loan & Trust Bldg.
Haigh, Joseph, 415 New York Life Bldg.
Hennessy Bros. & Evans, 605 and 606, 100 Washington St.
Knickerbocker Improvement Co., The, 92 La Salle St.
Lake City Construction Co., 322 Ashland Blk.
Lanquist, A., 615-616 Chamber of Commerce.
Leach, L. L. & Son, 1402 Marquette Bldg.
Leafgreen Brothers, 614 Chamber of Commerce.
Lotz, Philip, 610, 58 Wabash Av.
Mayor, William Co., 167 Dearborn St.
Meagher, Arthur, Room 62, 164 La Salle St.
McCall, T. A. & Co., 1003 Ft. Dearborn Bldg.
McCarty Brothers, 804, 134 Monroe St.
Mortimer, W. H. & C. J., 1109, 184 La Salle St.
Mueller, Paul F. P., 823 Schiller Bldg.
Nelson & Peterson, 84 La Salle St.
Rodatz, Jacob, 414 The Rookery.
Schlueter, Henry W., 1351 Marquette Bldg.
Sollitt, Ralph & Sumner Co., 140 Dearborn St.
Sproul, Elliott W., 407 Chamber of Commerce.
Strandberg, E. P. & Bros., 1211 Manhattan Bldg.

Swift, Geo. B. Company, 902-904 Security Bldg.
Thomson, Geo. & Son Co., 167 Dearborn St.
Wells, W. A. & A. E., 1014 Monadnock Bldg.
Williams, George & Co., room 11, 92 La Salle St.

METAL CEILINGS.

Encaustique Metal Interior Co., 113 Adams St.
Friedley & Voshardt, 194-202 Mather St.
Knisely & Yeldham Co., 273-275 Canal St.
Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
Sykes Steel Roofing Co., 611 S. Morgan St.

METAL SASH AND FRAMES.

Knisely & Yeldham Co., 273 and 275 Canal St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
Miller, James A. & Bro., 129 S. Clinton St.
Sykes Steel Roofing Co., 611 S. Morgan St.
Voigtman & Company, 123-127 Ontario St.

METAL LATH.

Expanded Metal Fire-Proofing Co., 790 Old Colony Bldg.
International Metal Lath Co., Niles, O.
Sykes Steel Roofing Co., 611 S. Morgan St.
Voss, Frederick, 617-621 Austin Av.

MILL WORK—SASH, DOORS AND BLINDS.

Chicago Veneered Door Co., 316 Chamber of Commerce.
Cottage Grove Mfg. Co., 91 36th St.

MINERAL WOOL.

Chicago Fire-Proof Covering Co., 18-20 N. Canal St.
Watson, H. F., 80 E. Taylor St.

MIRRORS.

Hooker, H. M. Co., 57 W. Randolph St.
Rice, James H. Co., 34 to 40 South Water St.

MORTAR COLORS.

Chicago Hydraulic Press Brick Co., third floor, Chamber of Commerce Bldg.

MOSAICS.

Caretti, John & Co., 234 Michigan St.
Henry, Frank, 1628 Wabash Av.
Interior Woodworking Co., 296 Wabash Av.
Rees, George H., 91 Dearborn St.
Sherman & Flavin, 2511 State St.
Weary & Beck, 1449 Marquette Bldg.

NILES' PATENT MORTISE LOCKS.

Chicago Hardware Mfg. Co., 308 Ashland Blk.

NICKEL PLATING.

Alberene Stone Co., 115 S. Clinton St.

OFFICE FITTINGS.

Carsley Mfg. Co., 2242-2256 La Salle St.
Cottage Grove Mfg. Co., 91 38th St.
Davis, The Reginald J. Co., S. W. Cor. 23d and La Salle Sts.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.
Warren, William H. Mfg. Co., Blackhawk St. and Smith Av.

OFFICE FIXTURES AND FURNITURE—STEEL.

Art Metal Construction Co., 1113-1119 Merchants Loan & Trust Bldg.

OFFICE SPECIALTIES.

Art Metal Construction Co., 1113-1119 Merchants Loan & Trust Bldg.
Cottage Grove Mfg. Co., 91 38th St.

OVERHEAD PULLEYS.

Winslow Bros. Company, The, 368-408 Carroll Av.

PAINTS.

American Lucol Co., 44 Broadway, N. Y.
Heath & Milligan Mfg. Co., 172 Randolph St.
Lucas, John & Co., 55 N. Jefferson St.
New Jersey Zinc Co., The, 71 Broadway, N. Y.
Perkins, J. L. & Co., 241 Lake St.
Pitkin, Geo. W. Co., Fulton and Carpenter Sts.
Pittsburgh Plate Glass Co., 442 Wabash Av.

PAINTS—COLD WATER.

Speare's, The Alden Sons Co., 9 Milwaukee Av.

PAINT—GRAPHITE.

American Lucol Co., 44 Broadway, N. Y.
Carpenter, Geo. B. & Co., 200-208 S. Water St.
Heath & Milligan Mfg. Co., 172 Randolph St.
Lucas, John & Co., 55 N. Jefferson St.
Perkins, J. L. & Co., 241 Lake St.
Speare's, The Alden Sons Co., 9 Milwaukee Av.

PAINT—IRON.

Heath & Milligan Mfg. Co., 172 Randolph St.
Lucas, John & Co., 55 N. Jefferson St.
Perkins, J. L. & Co., 241 Lake St.
Speare's, The Alden Sons Co., 9 Milwaukee Av.

PAINTS—MIXED.

American Lucol Co., 44 Broadway, N. Y.
Heath & Milligan Mfg. Co., 172 Randolph St.
Perkins, J. L. & Co., 241 Lake St.
Pitkin, Geo. W. Co., Fulton and Carpenter Sts.
Pittsburgh Plate Glass Co., 442 Wabash Av.

PAINTS—ROOFING.

American Lucol Co., 44 Broadway, N. Y.
Bird, F. W. & Son, 1434 Monadnock Bldg.
Chicago Fire Proof Covering Co., 18-20 N. Canal St.
Heath & Milligan Mfg. Co., 172 Randolph St.
Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
Lucas, John & Co., 55 N. Jefferson St.
Manville Covering Co., 173 Randolph St.
Perkins, J. L. & Co., 241 Lake St.
Pitkin, Geo. W. Co., Fulton and Carpenter Sts.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.

PAINTERS.

Allen, Frank, 4828 N. Clark St. (Rogers Park).
Builders Painting & Decorating Co., 185 Dearborn St., room 603.
McCarthy, J. G. Company, 1832 Wabash Av.
Maxwell, J. F., 4771 N. Clark St.

PAINTERS' SUPPLIES.

Heath & Milligan Mfg. Co., 172 Randolph St.
Lucas, John & Co., 55 N. Jefferson St.
New Jersey Zinc Co., The, 71 Broadway, N. Y.
Perkins, J. L. & Co., 241 Lake St.
Pitkin, Geo. W. Co., Fulton and Carpenter Sts.
Pittsburgh Plate Glass Co., 442 Wabash Av.

PAPER HANGERS.

Builders Painting & Decorating Co., 185 Dearborn St., room 603.
McCarthy, J. G. Company, 1832 Wabash Av.

PARQUET FLOORS.

Chicago Floor Co., 159 Wabash Av.

PASSENGER AND FREIGHT ELEVATORS.

Burdett-Rountree Mfg. Co., 85-87 W. Jackson Blvd.
Eaton & Prince Co., 70-76 Michigan St.
Otis Elevator Co., 409 Fisher Bldg.
Winslow Bros. Company, The, 368-408 Carroll Av.

PHYSICAL LABORATORY.

Hunt, Robert W. & Co., 1121 The Rookery.

PIPE AND BOILER COVERING.

Chicago Fire Proof Covering Co., 18-20 N. Canal St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Manville Covering Co., 173 Randolph St.
Norton, F. J., 8 N. State St.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.
Thomas & Smith, 16 N. Canal St.
Watson, H. F. Co., 80 E. Taylor St.

PIPE—LEAD LINED.

Lead Lined Iron Pipe Co., Wakefield, Mass.

PLASTER.

Decorators Supply Co., The, 215 S. Clinton St.

PLASTERERS—ORNAMENTAL.

Decorators Supply Co., The, 215 S. Clinton St.

PLASTERING.

Heidorn, William D., 537 E. Cornelia St.
Lenox-Haldeman Co., 1109, 184 La Salle St.
Zander, Aug. Co., 512 Lakeside Bldg.

PLASTERING CONTRACTORS.

Heidorn, William D., 537 E. Cornelia St.
Lenox-Haldeman Co., 1109, 184 La Salle St.
McNulty Bros., 624 N. Y. Life Bldg.
Zander, Aug. Co., 512 Lakeside Bldg.

PLASTERING LATH.

Booth, John, 114 and 116 E. Lake St.
International Metal Lath Co., Niles, O.
Roebling Construction Co., The, 171-173 Lake St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Spry, John Lumber Co., Ashland Av. and 22d St.
Voss, Frederick, 617-621 Austin Av.

PLASTERING MATERIAL.
Adamant Manufacturing Co., 517 Chamber of Commerce.
Rock Plaster Mfg. Co., The, 1019 Chamber of Commerce.

PLASTIC RELIEF.
Decorators Supply Co., The, 215 S. Clinton St.
Weary & Beck, 1449 Marquette Bldg.

PLUMBING.
Art Plumbing Co., room 2, Reaper Blk.
Brown & Mortimer, 45 W. Washington St.
Byrne & Ryan, 4308 Cottage Grove Av.
Conlin, Thomas Plumbing & Heating Co., 3905 Cottage Grove Av.
Daly, J. J., 87 Fifth Av.
Murphy, P. M., 99 Washington St.
Roland, John G., 952 N. Halsted.

PLUMBING, GASFITTING AND SEWERAGE.
Art Plumbing Co., room 2, Reaper Blk.
Brown & Mortimer, 45 W. Washington St.
Byrne & Ryan, 4308 Cottage Grove Av.
Conlin, Thomas Plumbing & Heating Co., 3905 Cottage Grove Av.
Daly, J. J., 87 Fifth Av.
Duffy, E. S. Mfg. Co., 6438 Wentworth Av.
Lynam & Lodeski, 86 Fifth Av.
Murphy, P. M., 99 Washington St.
Roland, John G., 952 N. Halsted.
Thorogood, Robert F., 713 Greenleaf Av.
Wills & Smith, 5938 S. Halsted St.

PORTLAND CEMENT.
Empire Portland Cement Co., 737 Monadnock Blk.
Garden City Sand Co., The, 1201, 188 Madison St.
Moulding, Thomas Co., 1007 Chamber of Commerce Bldg.

POWER PLANTS.
Davis Construction Co., 75 Michigan St.

PREPARED ROOFING MATERIAL.
Bird, F. W. & Son, 1434 Monadnock Bldg.
Chicago Fire Proof Covering Co., 18-20 N. Canal St.
Murdoch, Wm. & Co., 167 Dearborn St.
Perkins, J. L. & Co., 241 Lake St.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.

PRESSURE HEATING.
Davis, G. M. Regulator Co., 120 N. Clinton St.
Kehm Bros. & Mertz, 19 N. State St.
Kellogg-Mackay-Cameron Co., 110 Lake St.

PRISMATIC GLASS.
American Luxfer Prism Co., 372 Fulton St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.

PUMP GOVERNORS.
Davis, G. M. Regulator Co., 120 N. Clinton St.

PUMPING.
Fanning Mfg. Co., Morgan, Pratt and Superior Sts.

PUMPING MACHINERY.
Kehm Bros. & Mertz, 19 N. State St.
Rider-Ericsson Engine Co., 40 Dearborn St.

PUMPS.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Rider-Ericsson Engine Co., 40 Dearborn St.
Thomas & Smith, 16 N. Canal St.

PUMPS—AUTOMATIC AND HYDRAULIC.
Kehm Bros. & Mertz, 19 N. State St.
Kellogg-Mackay-Cameron Co., 110 Lake St.

PUMPS—POWER.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Rider-Ericsson Engine Co., 40 Dearborn St.

RADIATORS.
American Radiator Co., 99 Lake St., cor. Dearborn.
Arcade Steam Heating Co., 70 La Salle St.
Holland Radiator Company, 38 Dearborn St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Norton, F. J., 8 N. State St.
Western Valve Co., 43 W. Randolph St.

RADIATOR VALVES.
American Radiator Co., 99 Lake St., cor. Dearborn.
Davis, G. M. Regulator Co., 120 N. Clinton St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Western Valve Co., 43 W. Randolph St.

RAILINGS AND GRILLES—BRASS.
Baldwin Brass Works, 232-234 S. Clinton St.
Columbian Hardware Co., 27 Lake St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.

READY ROOFING.
Bird, F. W. & Son, 1434 Monadnock Blk.

REFRIGERATING AND ICE MAKING MACHINERY.
Barber, A. H. Mfg. Co., 229 S. Water St.
Kroeschell Bros. Co., 55 Erie St.
Wolf, The Fred W. Co., 139-43 Rees St.

REFRIGERATORS.
Clark, J. H., 155 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Orr & Lockett Hardware Co., 71-73 Randolph St.
White Enamel Refrigerator Co., 291 Dearborn St.

REGISTERS.
McCoy, John, 31 Dearborn St.
Stowell Mfg. & Fury. Co., 86 Lake St.
Wireton Heating Company, 40 Dearborn St.

REGULATORS—DAMPER.
Davis, G. M. Regulator Co., 120 N. Clinton St.
McCoy, John, 31 Dearborn St.

REGULATORS—HEAT, ETC.
Davis, G. M. Regulator Co., 120 N. Clinton St.
Johnson Temperature Controlling Co., 411 Dearborn Ct.
McCoy, John, 31 Dearborn St.
Thomas & Smith, 16 N. Canal St.

REGULATORS—STEAM, AIR, WATER.
Burdett-Rountree Mfg. Co., 85-87 W. Jackson Blvd.
Davis, G. M. Regulator Co., 120 N. Clinton St.
McCoy, John, 31 Dearborn St.

ROOF COPING.
Perkins, J. L. & Co., 241 Lake St.

ROOFING.
Bird, F. W. & Son, 1434 Monadnock Blk.
Knisely & Yeldham Co., 273-275 Canal St.
Manville Covering Co., 173 Randolph St.
Miller, James A. & Bro., 129 S. Clinton St.
McFarland, J. C. & Co.
McIlroy's Cornice Works, 1519 State St.
Murdoch, Wm. & Co., 167 Dearborn St.
Powell, M. W. Co., 204 Dearborn.
Randolph, C. W., 825-827 Clifton Av.
Rosenbaum, H. 184 La Salle St.
Sykes Steel Roofing Co., 611 S. Morgan St.

ROOFING—ASBESTOS.
Chicago Fire-Proof Covering Co., 18-20 N. Canal St.

ROOFING—CORRUGATED IRON.
Knisely & Yeldham Co., 273-275 Canal St.
Lloyd Iron Roofing & Paint Co., The, 99-101 W. Monroe St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
McIlroy's Cornice Works, 1519 State St.
Perkins, J. L. & Co., 241 Lake St.
Schreiber, E. A., 156 W. Ohio St.
Sykes Steel Roofing Co., 611 S. Morgan St.

ROOFING—GRAVEL.
Griffith Cornice Works, 1716 Wabash Av.
Manville Covering Co., 173 Randolph St.
Murdoch, Wm. & Co., 167 Dearborn St.
Powell, M. W. Co., 204 Dearborn.
Randolph, C. W., 825-827 Clifton Av.
Rosenbaum, H. 184 La Salle St.
Sykes Steel Roofing Co., 611 S. Morgan St.

ROOFING SLATE DEALERS.
Speare's, The Alden Sons Co., 9 Milwaukee Av.

ROOFING—SLATE AND TILE.
Knisely & Yeldham Co., 273-275 Canal St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
McIlroy's Cornice Works, 1519 State St.
Miller, James A. & Bro., 129 S. Clinton St.
Powell, W. M. Co., 204 Dearborn St.
Sykes Steel Roofing Co., 611 S. Morgan St.

ROOFING—TIN PLATE.
Perkins, J. L. & Co., 241 Lake St.
Sykes Steel Roofing Co., 611 S. Morgan St.

ROOFING—TIN, SLATE, TILE AND METAL.
Griffith Cornice Works, 1716 Wabash Av.
Knisely & Yeldham Co., 273-275 Canal St.

McFarland, J. C. & Co., 27th St. and Fifth Av.
McIlroy's Cornice Works, 1519 State St.
Miller, James A. & Bro., 129 S. Clinton St.
Perkins, J. L. & Co., 241 Lake St.
Sykes Steel Roofing Co., 611 S. Morgan St.

ROOFING MATERIALS.

Manville Covering Co., 173 Randolph St.
Murdoch, Wm. & Co., 167 Dearborn St.
Perkins, J. L. & Co., 241 Lake St.
Powell, M. W. Co., 204 Dearborn.
Rosenbaum, H. 184 La Salle St.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.
Watson, H. F. Co., 80 E. Taylor St.

ROOFING PAPERS.

Bird, F. W. & Son, 1434 Monadnock Blk.
Manville Covering Co., 173 Randolph St.
Murdoch, Wm. & Co., 167 Dearborn St.
Perkins, J. L. & Co., 241 Lake St.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.
Watson, H. F. Co., 80 E. Taylor St.

ROOFING PAINTS.

American Lucol Co., 44 Broadway, N. Y.
Bird, F. W. & Son, 1434 Monadnock Blk.
Lucas, John & Co., 55 N. Jefferson St.
Manville Covering Co., 173 Randolph St.
Perkins, J. L., 241 Lake St.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.

ROPE—WIRE.

Carpenter, Geo. B. & Co., 200-208 S. Water St.

ROLLING STEEL DOORS AND SHUTTERS.

Kinnear Mfg. Co., The, 911, 112 Clark St.
Rolling Steel Shutter Works, 162-164 27th St., New York.

RUBBER GOODS.

Gutta Percha & Rubber Mfg. Co., The, 96-98 Lake St.

RUBBER HOSE AND PACKING.

Carpenter, Geo. B. & Co., 200-208 S. Water St.
Kellogg-Mackay-Cameron Co., 110 Lake St.

RUBBER TILING.

Gutta Percha & Rubber Mfg. Co., The, 96-98 Lake St.

SAND.

Garden City Sand Co., The, 1201, 188 Madison St.

SAND AND GRAVEL.

Garden City Sand Co., The, 1201, 188 Madison St.
Knickerbocker Ice Co., 716, 171 La Salle St.

SANITARY APPLIANCES.

Cragin Garbage Crematory Co., 285 43d St.

SANITARY PIPE—LEAD LINED.

Lead Lined Iron Pipe Co., Wakefield, Mass.

SASH CORD.

Carpenter, Geo. B. & Co., 200-208 S. Water St.
Samson Cordage Works, 115 Congress St., Boston, Mass.

SASH, DOORS AND BLINDS.

Chicago Veneered Door Co., 316 Chamber of Commerce.
Compound Door Co., 189 La Salle St., room 820.
Cottage Grove Mfg. Co., 91 38th St.
Spry, John Lumber Co., Ashland Av. and 22d St.
True & True Co., Blue Island Av. and Lincoln St.

SASH LOCKS.

Gardner Sash Balance Co., 312 First Nat'l Bank Bldg.

SASH PULLEYS.

Gardner Sash Balance Co., 312 First Nat'l Bank Bldg.

SASH RIBBON.

Gardner Sash Balance Co., 312 First Nat'l Bank Bldg.

SASH WEIGHTS.

Gardner Sash Balance Co., 312 First Nat'l Bank Bldg.

SCAGLIOLA.

Henry, Frank, 1628 Wabash Av.

SEWER PIPE.

Williams, N. A. Co., 219 Washington St.

SHEATHING PAPER.

Bird, F. W. & Son, 1434 Monadnock Blk.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Manville Covering Co., 173 Randolph St.
Watson, H. F. Co., 80 E. Taylor St.

SHINGLE STAINS.

Lucas, John Co., 55 N. Jefferson St.
Manville Covering Co., 173 Randolph St.
Sall Mountain Asbestos Mfg. Co., 123-127 Ontario St.

SIDEBOARDS.

Carsley Mfg. Co., 2242-2256 La Salle St.
Davis, The Reginald J. Co., S. W. Cor. 23d and La Salle.
Rees, George H., 91 Dearborn St.

SIDEWALK AND VAULT LIGHTS.

American Luxfer Prism Co., 372 Fulton St.
American Sidewalk Light Co., 158 W. Ohio St.
Brown Bros. Mfg. Co., Jackson Blvd. N. W. Cor. Clinton.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Simpson Company, Chamber of Commerce Bldg.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.

SIDEWALK BUILDERS.

Gilbert, Harry S., 232 Lunt Av., Rogers Park.
Knickerbocker Improvement Co., The, 92 La Salle St.
Maynard, E. W. 439 64th St.
Simpson Company, Chamber of Commerce Bldg.

SIDEWALKS.

American Sidewalk Light Co., 158 W. Ohio St.

SIDEWALK FILLINGS.

Central Wrecking Co., 87 Washington St.

SIGNALS—ELEVATOR.

Burdett-Romtree Mfg. Co., 85-87 W. Jackson Blvd.

SIGN PAINTERS.

Builders Painting & Decorating Co., 185 Dearborn St., room 603.

SKYLIGHTS.

Griffith Cornice Works, 1716 Wabash Av.
Knisely & Yeldham Co., 273-275 Canal St.
Miller, James A. & Bro., 129 S. Clinton St.
Sykes Steel Roofing Co., 611 S. Morgan St.

SKYLIGHTS—METAL.

Knisely & Yeldham Co., 273-275 Canal St.
McFarland, J. C. & Co., 27th St. and Fifth Av.
Sykes Steel Roofing Co., 611 S. Morgan St.

SMOKELESS FURNACES.

Hawley Down Draft Furnace Co., Superior and Townsend Sts.
Herbert, M. E. Heater Co., 240-242 Root St.
Kroeschell Bros. Co., 55 Erie St.

SOUNDINGS FOR FOUNDATIONS.

Needham Water Works Co., 96-98 W. Lake St.

STABLE FIXTURES.

Booth, John, 114 and 116 E. Lake St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.

STAINED GLASS.

Mitchel & Halbach, 264 Michigan Av.

STAIRS.

Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.

STAIRS AND RAILINGS.

Carsley Mfg. Co., 2242-2256 La Salle St.
Davis, The Reginald J. Co., S. W. Cor. 22d and La Salle.
Hammill Fire Escape Co., 1008, 112 Clark St.
Landon & Eggers Iron & Wire Works, 103 S. Canal St.
Luce, C. K., 1008, 112 Clark St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Architectural Iron Works, The, 181 Newberry Av.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.

Warren, William H. Mfg. Co., Blackhawk St. and Smith Av.

STAIR WORK.

Carsley Mfg. Co., 2242-2256 La Salle St.
Cottage Grove Mfg. Co., 91 38th St.
Davis, The Reginald J. Co., S. W. Cor. 23d and La Salle.
Luce, C. K., 1008, 112 Clark St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Standard Company, The, N. W. Cor. 15th and Laflin Sts.
Voss, Frederick, 617-621 Austin Av.
Warren, William H. Mfg. Co., Blackhawk St. and Smith Av.

STAND PIPES.

Hammill Fire Escape Co., 1008, 112 Clark St.
Kroeschell Bros. Co., 55 Erie St.
Petersen & De Hosson Mfg. Co., 1013 N. Y. Life Bldg.
Schreiber, E. A., 156 W. Ohio St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.

STATUARY—METAL.

Booth, John, 114 and 116 E. Lake St.
Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Winslow Bros. Company, The, 368-408 Carroll Av.

STEAM AND HOT WATER HEATING.

American Radiator Co., 99 Lake St., Cor. Dearborn.
Arcade Steam Heating Co., 70 La Salle St.
Baker & Smith Co., 93-95 Fifth Av.
Davis Construction Co., 75 Michigan St.
Douglas, T. J., 40 Dearborn, room 416.
Graves Bros. & Co., 156 Lake St.
Graves, W. B., 116 Lake St.
Herbert, M. E. Heater Co., 240-242 Root St.
Ideal Heating Company, 414 W. 63d St.
International Heater Co., 48 Dearborn St.
Kehm Bros. & Mertz, 19 N. State St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Murphy, P. M., 99 Washington St.
Norton, F. J., 8 N. State St.
Phillips-Getschow Co., 98 La Salle Av.
Pope, W. A., 79 Lake St.
Roland, John G., 952 N. Halsted.
Schampel, G. F., 155 Washington St.
McCoy, John, 31 Dearborn St.
Wills & Smith, 5938 S. Halsted St.

STEAM BOILERS.

American Radiator Co., 99 Lake St., Cor. Dearborn.
Davis Construction Co., 75 Michigan St.
International Heater Co., 48 Dearborn St.
Kehm Bros. & Mertz, 19 N. State St.
Kellogg-Mackay-Cameron Co., 110 Lake St.
Kewanee Boiler Co., 167-169 Lake St.
Kroeschell Bros. Co., 55 Erie St.
Norton, F. J., 8 N. State St.
Wilks, S. Mfg. Co., 53-55 S. Clinton St.

STEAM ELEVATORS.

Eaton & Prince Co., 70-76 Michigan St.
Otis Elevator Co., 409 Fisher Bldg.

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Pope, W. A., 79 Lake St.

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Voss, Frederick, 617-621 Austin Av.

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Roebling Construction Co., The, 171-173 Lake St.
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Voss, Frederick, 617-621 Austin Av.

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Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.

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Miller, James A. & Bro., 129 S. Clinton St.
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Sykes Steel Roofing Co., 611 S. Morgan St.
Voigtman & Company, 123-127 Ontario St.

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Smith, F. P. Wire & Iron Works, 100-102 Lake St.
Voss, Frederick, 617-621 Austin Av.

WIRE GUARDS AND SCREENS.

Standard Company, The, N. W. Cor. 15th and Laflin Sts.

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International Metal Lath Co., Niles, O.
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Smith, F. P. Wire & Iron Works, 100-102 Lake St.
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